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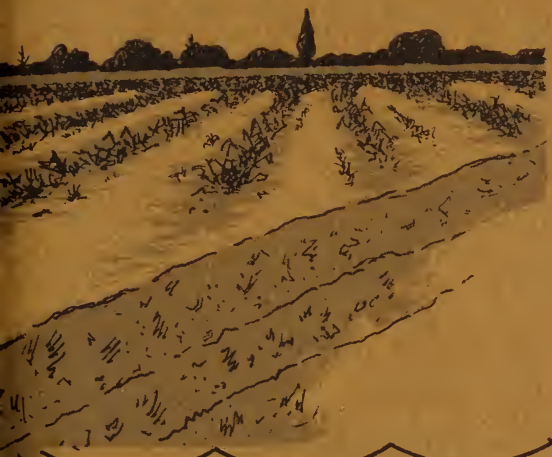

DRAINAGE OF AGRICULTURAL LAND-A Bibliography of Selected References

U. S. DEPARTMENT OF AGRICULTURE

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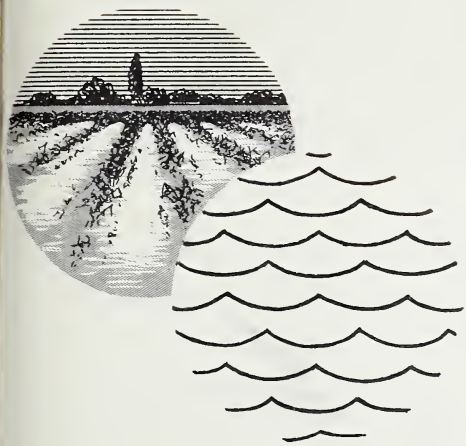

DRAINAGE OF AGRICULTURAL LAND—A Bibliography of Selected References

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Israelsen, O. W. Published References Regarding Drainage. n.p. 1953. 23 p.

National Research Council. Highway Research Board. Survey and Treatment of Marsh Deposits. Natl. Res. Council Highway Res. Bd. Bibliog. 15,95 p. 1954.

U. S. Soil Conservation Serv. Annotated Bibliography on Sedimentation. U. S. Soil Conservation Serv. Sedimentation B. 2,351 p. Feb.1950.

PREFACE

This bibliography contains selected, annotated references to the literature published between 1936 and 1955 on the drainage of land for farming. Subjects included are methods and techniques, equipment, soil science and hydrology as related to drainage problems, needs and effects of drainage, descriptions of specific projects in many different countries, and drainage law and financing of drainage projects in the United States. Drainage for mosquito control and drainage of forests have been included, but references on drainage of land for nonagricultural uses such as roads and airports have been omitted except when techniques described are specifically applicable to agricultural projects. Because of the importance of the ground-water problem in the Western States to drainage questions, references on ground water in this area have been included, even when they do not themselves relate specifically to drainage.

Material in languages other than English has been limited to the practical aspects of drainage. Such references are cited in the vernacular with either a translation of the title into English or a brief abstract in English, except that for languages not using the Roman alphabet, titles of journal articles are given only in translation.

The bibliography is arranged according to a subject classification, and is provided with a combined author, subject, and geographic index. Because of the preponderance of material relating to the United States, this term has not been used in the index. Names of individual States and groups of States, however, will be found in the index.

For literature published before 1936 the reader should consult Bibliography on Land Drainage, by Dorothy W. Graf, published in 1936 by the Bureau of Agricultural Engineering of the Department of Agriculture, now out of print, but available in many libraries.

The Library acknowledges gratefully the assistance of Mr. John G. Sutton of the Soil Conservation Service, who helped in the formulation of the bibliography, answered many technical questions as it progressed, and advised on the inclusion of doubtful references.

All references except those marked with an asterisk have been examined by the compilers. Call numbers following the body of the citation are those of the Library of the Department of Agriculture. The location in another library of the copy used has been shown in the case of publications not available at the Department of Agriculture.

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A Bibliography of Selected References

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GENERAL

1. AKADEMIE FUR RAUMFORSCHUNG UND LANDESPLANUNG. Landschaftspflege und meliorationen. Akad. f. Raumforsch. u. Landesplanung. Umschaudienst 5(1),74 p. 1955. 280.9 Ak13

A source book of material on drainage and land improvement in various countries, including Finland, the Netherlands, Austria, the Soviet Union, the United States, Switzerland, Egypt, the Sudan, Morocco, India, Australia, and China.

2. AYRES, Q. C., and SCOATES, D. Land drainage and reclamation. Ed.2. New York, McGraw-Hill, 1939. 496 p., illus., maps, tables. Ref. 54 Ay7

Partial contents: Ch. 11, Drainage properties of soils; Ch. 13, Open-ditch design; Ch. 17, Drainage districts; Ch. 19, Explosives and their use; Ch. 22, Terracing; Ch. 24, Subsurface drainage; Ch. 25, Location of tile drains; Ch. 26, Design of tile drains; Ch. 27, Selection of tile; Ch. 28, Installation of tile; Ch. 29, Drain-tile accessories; Ch. 30, Estimating cost of tile drainage; Ch. 31, Special methods of drainage.

3. CHAMBERS, T. B. Engineering in soil and water conservation. Soil Conserv. 4:153-156. Jan.1939. 1.6 So3S

General discussion of land drainage from the engineer's standpoint.

4. CLYDE, G. D. Water use and disposal with particular reference to irrigation, drainage, and reclamation in the United States of America. Interamer. Conf. Agr. 4th. U. S. Paper 3,20 p. Dec.1950. Ref. 5 In8204

Discusses drainage of humid regions as well as drainage of irrigated arid areas of the United States.

Also in Conserv. Amer. 9:3-15. Apr.1951. Ref. 279.8 C767

5. DEWHIRST, J. F. Land and water conservation and development. In his America's needs and resources; a new survey, p. 513-574. New York, Twentieth Century Fund, 1955. Ref. 280.12 D512

Includes drainage enterprises and programs, drainage possibilities, and costs of farm drainage.

6. ETCHEVERRY, B. A. Land drainage and flood protection. Stanford University, Calif., Stanford U. Press, 1940. 327 p., illus., tables. Ref. 54 Et1

Partial contents: Ch. 3, Harmful effects of lack of drainage; Ch. 4, Volume of drainage water; Ch. 5, General operations for the drainage of large areas and drainage by open channels; Ch. 6, Underdrainage; Ch. 7, Special cases of drainage problems; Ch. 8, Properties of drain tile, construction and maintenance of tile drains; Ch. 9, Drainage of

irrigated lands; Ch. 13, Drainage and reclamation districts.

7. FREVERT, R. K., and others. Soil and water conservation engineering. New York, Wiley, 1955. 479 p., illus., maps. Ref. 56.7 F89

G. O. Schwab, T. W. Edminster, and K. K. Barnes, joint authors.

Covers infiltration, runoff, soil physics, erosion, contouring, terracing, grassed waterways, grassed outlets, gully control, open-ditch drainage, subsurface drainage design, mole drains, tile drains, selection of tile, installation of mole and tile drains, pumps and pump drainage, and the drainage of peat and muck soils.

8. GAIN, E. W. Land drainage in Great Britain. J. Soil & Water Conserv. 1(1):5-10. July 1946. 56.8 J822

History and legislation are given. Pump drainage in the Fens, various types of ditches on clay soils and mole drains are discussed. Underdrainage includes stone drains; trenches filled with gravel, brush, or sod; brick drains; and clay pipes.

9. HUDSON, A. W., and HOPEWELL, H. G. The draining of farm lands. Massey Agr. Col. B. 18, 184 p., illus., tables. June 1950. Ref. 109 M38B

Contents: Ch. 1, The soil and the characteristics of soil water and its movement; Ch. 2, Surveying for the drainage system; Ch. 3, Open drains; Ch. 4, Tiles and other covered drains; Ch. 5, Mole drainage; Ch. 6, Farm drainage machinery; Ch. 7, The financial aspects of farm drainage; Ch. 8, Land drainage by pumping; Ch. 9, The drainage of peats and loams. New Zealand.

10. IDAHO STATE PLANNING BOARD. Drainage basins in Idaho. Boise, 1937. 248 p., maps, tables. (Water resources of Idaho, v. 1) 280.7 Id1W

National Resources Committee cooperating.

Includes material on ground water and artificial drainage, for which the index should be consulted.

11. ISRAELSEN, O. W. The historical background of reclamation. Agr. Engin. 32:321-324, illus. June 1951. Ref. 58.8 Ag83

Includes a history of drainage in England and Wales since 1252 A. D., in Italy since Julius Caesar's time, and in the United States since 1835.

12. JONES, L. A. Drainage as a conservation practice. Agr. Engin. 23:97-98, illus. Mar. 1942. 58.8 Ag83

The part played by land drainage in the development of American agriculture.

13. LEOPOLD, L. B., and MADDOCK, T. The flood control controversy: big dams, little dams, and land management. New York, Ronald, 1954. 278 p., illus., tables. Ref. 290 L55

Includes terracing, drainage, channel engineering, and Government participation in flood-control operations.

14. LOWDERMILK, W. C. Conquest of the land through seven thousand years. U. S. D. A. Agr. Inform. B. 99, 30 p., illus. Aug. 1953. 1 Ag84Ab

Reclamation and drainage from Sumerian times to the present.

15. LYRA, I. DE A. A drenagem. Pernambuco. Sec. de Agr., Indus. e Com. B. 13:34-47. Jan./Mar. 1946. Ref. 9.2 P423

Includes a history of agricultural drainage since Roman times, and methods and advantages of drainage. Brazil.

16. MILLER, G. J. Reclamation of wet and overflow lands. In Smith, G.-H., ed. Conservation of Natural Resources, p. 145-159, maps, tables. New York, Wiley, 1950. Ref. U. S. Dept. Interior Libr.

Section heads include: Distribution of wet lands; The purpose of drainage; State ownership and regulation; Growth of organized drainage; Drainage in the Great Lakes region; Lower Mississippi Basin region; Gains and losses from drainage.

Also in Parkins, A. E., and Whitaker, Jr., ed., Our natural re-

sources and their conservation, ed. 2, p. 152-168, maps, tables. New York, Wiley, 1939. 279 P22

17. NICHOLSON, H. H. The principles of field drainage. Cambridge, U. Press, 1953. 163 p., illus., tables. Ref. 54 N52

Partial contents; Ch. 2, The history of field-draining developments in Great Britain; Ch. 8, Ditches; Ch. 9, Tile draining; Ch. 10, Mole draining; Ch. 11, The way in which drains work; Ch. 14, Field drainage—present position and progress.

18. PICKELS, G. W. Drainage and flood-control engineering. Ed. 2. New York, McGraw-Hill, 1941. 476 p., illus., tables. Ref. 54 P58

Partial contents; Ch. 5, Flow of water in open channels; Ch. 6, Flow of water in tile drains; Ch. 7, Land drainage by open channels; Ch. 9, Underdrainage; Ch. 10, Pumping plants for drainage districts; Ch. 11, Flood protection by channel improvement; Ch. 14, Drainage law.

19. RAGGIO, J. L. Hidraulica agrícola. Buenos Aires, El Ateneo, 1947. 563 p., illus., maps. Ref. 290 R123

Drainage, p. 443-472.

20. RAO, K. M. G. Principles of irrigation and drainage. Bangalore, Bangalore Printing & Pub. Co., 1945. 49 p., illus. Ref. 55 G96

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21. ROE, H. B., and AYRES, Q. C. Engineering for agricultural drainage. New York, McGraw-Hill, 1954. 501 p., illus., maps, tables. Ref. 54 R62

Partial contents: Ch. 2, Soils in relation to drainage; Ch. 6, Major types of drains and drainage problems; Ch. 7, Design of open ditches; Ch. 8, Open-ditch construction; Ch. 9, Open-ditch maintenance; Ch. 10, Location and design of underdrains; Ch. 11, Drain tiles: kinds, classes, established sizes, and standards of quality; Ch. 12, Construction of under drains; Ch. 13, Drainage of irrigated lands; Ch. 14, The soil-moisture control problem on peat and muck lands; Ch. 15, Cost of drainage; Ch. 16, Drainage administration and law.

22. SUTTON, J. G. Drainage in the humid areas of the United States. Amer. Soc. Civ. Engin. Proc. 80(Separate 460), 18 p., maps, tables. July 1954. 290.9 Am3Ps

Section heads include: Extent of drainage; Drainage enterprises; Land in need of drainage; Soil Conservation District program; Special State programs; Drainage and flood control; Drainage requirements of culverts and bridges; Tile drainage.

23. U. S. BUR. OF THE CENSUS. 1950 census of agriculture. Volume IV, Drainage of agricultural lands. Washington, 1952. 307 p., tables. 157.41 C332

24. U. S. BUR. OF THE CENSUS. Sixteenth Census of the United States: 1940. Drainage of agricultural lands; land in drainage enterprises, capital invested, and drainage works. Washington, 1942. 683 p., maps, tables. 157.4 C167A

25. U. S. SOIL CONSERVATION SERV. Report of the Chief, 1935-53. Washington, 1935-53. 19 v., illus., maps, tables. 1.6 So3R

Reports before 1939 included watershed and hydrologic studies, sedimentation and hydraulics, flood control, diversion ditches, water-conservation dams, gully control, etc. Beginning in 1939 each report contains a section devoted to drainage.

26. WEIR, W. W. Irrigation and land drainage. In his Soil science, rev. ed., p. 247-267, illus., Philadelphia, Lippincott, 1949. 56 W43

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27. WILLIAMS, P. C. Land reclamation and drainage. Land Agents' Soc. J. 50:119-121. Mar.1951. 282.9 L22
A brief résumé and criticism of the literature of land drainage, particularly in England, since 1646.

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28. ALLISON, L. E., and REEVE, R. C. Lysimeters for studying effects of salinity, leaching, and position of water table on plant growth. Soil Sci. 79:81-91,illus.,table. Feb.1955. Ref. 56.8 So3
Experiments at the U. S. Salinity Laboratory.

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Measurements of amount of pore space drained in one hour under 60 cm. of water tension and of percolation rates was used as a basis. Various soil types were used.

32. BOUMANS, J. H. Het bepalen van de drainage-afstand met behulp van de boorgatenmethods. Landbk. Tijdschr. 65:82-104,illus. Feb./Mar.1953. Ref. 105.2 Or3
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P. J. Zwerman, H. E. Gray, and G. Levine, joint authors.
Techniques developed on the stony, glacial,till soils of central New York, for measuring water-table elevations, ground-water pressures, and soil permeability in connection with subsurface drainage.

34. BRETTING, A. E. Hydraulics, irrigation and drainage, reclamation and water-power plants. In The humanities and the sciences in Denmark, p. 708-711. Copenhagen,Munksgaard,1948. Ref. 330 H882
A résumé of the drainage investigations in Denmark between 1940 and 1945.

35. CHILDS, E. C. The movement of water in heavy soils after irrigation. Soil Sci. 46:95-105,illus. Aug.1938. Ref. 56.8 So3
Research in connection with drainage of heavy clay soils in humid climates, and with similar soils in arid climates after irrigation.

36. CHRISTIANSEN, J. E. Ground-water studies in relation to drainage. Agr. Engin. 24:339-342,illus. Oct.1943. Ref. 58.8 Ag83
A discussion of the value of piezometers for studying the flow of ground water and as an aid in determining the actual permeabilities of soil strata.

37. COLMAN, E. A. A laboratory study of lysimeter drainage under controlled soil moisture tension. Soil Sci. 62:365-382,illus., tables. Nov.1946. 56.8 So3
On the basis of the present study, drainage of lysimeter soils under controlled moisture tension offers a possible solution to the problems of the removal of abnormal moisture usually found in those gravity-

drained lysimeters in which seepage water must cross a soil/air interface.

38. DONNAN, W. W., and BRADSHAW, G. B. Drainage investigation methods for irrigated areas in western United States. U. S. D. A. Tech. B. 1065,45 p.,illus. Sept.1952. Ref. Ag84Te

Material based largely on studies made over a period of years in Imperial and San Fernando Valleys in California. Covers ground-surface investigations, soil investigations, water-table investigations, water-source surveys, and types of drainage systems and structures.

39. FIALKOVSKII, P. G., and SHRAG, V. I. Problems and objectives of soil investigations in marshy and swampy territories for the purpose of planning drainage measures. (In Russian.) Pochvovedenie 4:82-84. Apr.1955. 57.8 P34

40. GARDNER, W., and KIRKHAM, D. Determination of soil moisture by neutron scattering. Soil Sci. 73:391-401,illus.,tables. May 1952. Ref. 56.8 So3

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Details with diagrams and photographs.

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42. GAY, C. B., and THORNTON, J. F. Drainage and use of soils along the south Atlantic coast. (Abs.) Assoc. South. Agr. Workers Proc. 48:170-171. 1951. 4 C82

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43. GLENTWORTH, R. Distribution of the total and acetic acid-soluble phosphate in soil profiles having naturally free and impeded drainage. Nature 159:441-442. Mar.29,1947. 472 N21

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44. HENDRICK, J., and WELSH, H. D. Further results from the Craibstone drain gauges. Highland & Agr. Soc. Scotland.Trans. (5th ser.) 50:184-202,tables. 1938. 10 H536

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46. ISRAELSEN, O. W., and REEVE, R. C. Canal lining experiments in the Delta area, Utah. Utah Agr. Expt. Sta. B. 313,52 p., illus.,tables. June 1944. 100 Ut1

Data collected in a three-year experimental study of seepage losses from typical canal sections. Includes studies of flow of ground water.

47. JAMISON, V. C., REED, I. F., and PEARSON, R. W. The use of soil-tension columns and a modified form of the back pressure well in studying porosity and drainage properties of tillage testing soils. Soil Sci. Soc. Amer. Proc. 13:56-61,illus.,tables. 1948,pub. 1949. Ref. 56.9 So3

Pressure-control apparatus and pressure-plate cells used for tension studies of the soils as well as soil-tension columns used in drainage studies are described. From the data one should expect all

but dispersed clays to drain to optimum plowing moisture at a tension of one atmosphere or less.

48. JOHNSON, H. P., FREVERT, R. K., and EVANS, D. D. Simplified procedure for the measurement and computation of soil permeability below the water table. Agr. Engin. 33:283-286,illus. May 1952. 58.8 Ag83

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50. KOHNKE, H., DREIBELBIS, F. R., and DAVIDSON, J. M. A survey and discussion of lysimeters and a bibliography on their construction and performance. U. S. D. A. Misc. P. 372,67 p.,tables. May 1940. Ref. 1 Ag84M

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A résumé of several articles appearing in various Russian technical magazines concerning drainage and irrigation research in the USSR.

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A resistance network employing variable resistors or rheostats is described. The network is capable of solving Laplace's equation and hence is of use in analyzing drainage problems.

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Abstract of thesis - (Ph.D.) Iowa State College, 1949.

A field method of measuring the soil permeability beneath a water table, in relation to placement of drainage tiles.

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55. REEVE, R. C., and JENSEN, M. C. Piezometers for groundwater flow studies and measurement of subsoil permeability. Agr. Engin. 30:435-438,illus.,tables. Sept.1949. Ref. 58.8 Ag83

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A. F. Pillsbury, R. C. Reeve, and R. K. Peterson, joint authors.

With the completion of the Coachella branch of the All-American Canal, "there is evidence that ... water tables will rise and may cause serious drainage difficulties in the future. ... It is the purpose of these investigations to obtain such information ... as will lead to early detection and delineation of drainage problems," p. 559.

57. RICHARDS, L. A. Hydraulics of water in unsaturated soil. Agr. Engin. 22:325-326,illus. Sept.1941. 58.8 Ag83

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61. STEARNS, L. A. Symposium on water management and drainage for mosquito control; introductory statement. N. J. Mosquito Extermin. Assoc. Proc. 38:64-66. 1951. Ref. 420 N46
Brief résumé of drainage literature since 1904.

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English summary, p. 48.
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69. ASGHAR, A. G., and DHAWAN, C. L. The quality of the drain, river and canal waters of the Punjab. Indian J. Agr. Sci. 17: 377-388,illus.,tables. Dec.1947. 22 Ag831
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U. S. Bur. of Agricultural Engineering, cooperating.
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72. BEEKOM, C. W. C. VAN, and others. Reclaiming land flooded with salt water. Netherlands J. Agr. Sci. 1:153-163; 225-244,illus., tables. Aug.-Nov.1953. 12 N3892
C. van den Berg, T. A. de Boer, W. H. van der Molen, B. Verhoeven, J. J. Westerhof, and A. J. Zuur, joint authors.
Includes drainage.

73. BENNETT, H. H. Engineering in soil conservation. Agr. Engin. 28:559-562. Dec.1947. 58.8 Ag83
Includes drainage in the United States.

74. BENNETT, H. H. Soil conservation. New York,McGraw-Hill,1939. 993 p.,illus.,tables. 56.7 B43S
Partial contents; Ch. 8, Infiltration in relation to runoff; Ch. 20, Terracing; Ch. 21, Runoff-disposal channelways and outlets.
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75. CHILDS, E. C., and COLLIS-GEORGE, N. The control of soil water. Advn. Agron. 2:233-272,illus. 1950. Ref. 30 Ad9
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76. CHILDS, E. C. Stability of clay soils. Soil Sci. 53:79-92, illus.,tables. Feb.1942. 56.8 So3
Experiments in England to determine the suitability of soil for mole drainage.

77. CHILDS, E. C. The water table, equipotentials, and streamlines in drained land. 1-6. Soil Sci. 56:317-330; 59:313-327,405-415; 62:183-192; 63:361-376; 71:233-237,illus. Nov.1943, Apr.-May 1945, Aug.1946, May 1947, Mar.1951. 56.8 So3
Three sets of experiments are presented to show (a) how the water table falls with increase of drain diameter; (b) the relation of water-table height to rate of rainfall; and (c) the influence of the depth of the impermeable floor below the drains.

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Ditches and terraces to conserve excess rainfall while preventing soil erosion due to runoff.

79. COLMAN, E. A. The dependence of field capacity upon the depth of wetting of field soils. Soil Sci. 58:43-50,illus. July 1944. 56.8 So3
A tentative explanation is presented, relating the field-capacity values to the water supply available for drainage and the distribution of permeability and moisture potential gradients through the wet zone at the time when the drainage rate has become insignificantly small. The study suggests that shallow field irrigations or the irrigation and drainage of short soil columns in the laboratory do not necessarily provide valid measures of the field capacity of a soil

80. CRANFIELD, T. H. Damage to agricultural land resulting from flooding with sea water. Gt. Brit. Min. Agr. Agriculture 45:11-15. Apr.1938. 10 G79J
Tests made after the Essex and Humber floods of 1897 and 1921 showed that salt water destroyed the natural drainage of land.

81. CROMPTON, E. Some morphological features associated with poor soil drainage. J. Soil Sci. 3:277-289,illus. July 1952. Ref.

56.8 J823
Some morphological features of profiles showing various degrees of hydromorphism are described from soils under permanent pasture in northwest England. It is suggested that certain basic patterns are discernible in most gley soils, and the modifications resulting from variations in texture, structure, and position of the water table in the profile are discussed.

82. DAHL, N. J., and JUUSELA, T. Dränering. Nord. Jordbrforsk. 1948:657-672,illus. 11 N752
The hydraulic basis for calculating distance between drainage pipes, by N. J. Dahl, p. 657-663; Heat and moisture conditions in drained and open ditch fields, by T. Juusela, p. 663-670. Discussion, p. 670-672.

83. DAIGH, F. C., and STEARNS, L. A. Effect of ditching for mosquito control on the pH of marsh soils. N. J. Mosquito Extermin. Assoc. Proc. 26:39-43,tables. 1939. 420 N46
A study conducted at the Delaware Agricultural Experiment Station shows that the pH of marsh soils increases somewhat in proportion to the extent of drainage.

84. DAVISON, B., and ROSENHEAD, L. Some cases of the steady two-dimensional percolation of water through ground. Roy. Soc. London Proc. A. 175:346-365. 1940. 501 L84A
Mathematical solutions are presented for percolation through a broad embankment with vertical faces, and for percolation from a dyke of rectangular section into the surrounding soil. The motion of water outside a number of parallel draining tubes is investigated.

85. DAY, P. R., and LUTHIN, J. N. Sand-model experiments on the distribution of water-pressure under an unlined canal. Soil Sci. Soc. Amer. Proc. 18:133-136,illus.,tables. Apr.1954. 56.9 So3
A study of the seepage of water by capillary flow, as an aid in the understanding of seepage in irrigation and drainage engineering.

86. DELOFFRE, G. The leaching of chlorides in the regions of Dunquerque and Le Verdon flooded with salt water in 1944. Internatl. Cong. Soil Sci. 4th Trans. 1:408-411. 1950. 56.09 In844
The efficient network of drainage in the Dunkirk area hastened the leaching process. In the Le Verdon area the slow leaching was due to poor drainage.

87. DEMOLON, A., and BASTISSE, E. M. Études lysimétriques appliquées a l'agronomie. Paris. Min. Agr. France,1942. 48 p.,illus., tables. Ref. 56.43 D39
Lysimetric studies applied to agronomy. Report of 10 years of research at Versailles. The composition of drainage water is discussed, and the degrees of progressive exhaustion of bare and cultivated soils are compared.

88. DEVEREUX, R. E., STEELE, F., and TURNER, W. L. JR. Permeability and land classification for soil and water conservation. Soil Sci. Soc. Amer. Proc. 15:420-423. 1950,pub.1951. 56.9 So3
Studies made by the Virginia Agricultural Experiment Station and the U. S. Soil Conservation Service, to evaluate the relative success of existing drainage systems, and to design new drainage systems on the basis of information secured in the study.

89. DOMINGO, W. R. De physische rijping van de jongere Zuiderzee-afzettingen in de Noordoostpolder. Van Zee tot Land 2, 18 p.,illus. 1951. Ref. 54.8 V26
The physical maturing of the younger Zuiderzee deposits in the Northeast Polder. Includes drainage conditions.

90. DOUGALL, H. W. Factors concerned in the reclamation, poldering, and fertility of certain riverain soils in Sierra Leone. Internatl. Cong. Soil Sci. 4th Trans. 2:250-253,illus. 1950. 56.09 In844
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91. DOUGALL, H. W. A note on the reclamation of soils inundated with sea water. Internatl. Cong. Soil Sci. 4th Trans. 1:407-408. 1950. 56.09 In844
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92. DREIBELBIS, F. R., and POST, F. A. An inventory of soil water relationships on woodland, pasture, and cultivated soils. Soil Sci. Soc. Amer. Proc. 6:462-473,illus,,tables. 1941. Ref. 56.9 So3
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A study of soil moisture conditions under different land use practices and their relationship to precipitation, runoff, percolation, evaporation-transpiration, and storage of water in the soil.

93. DREIBELBIS, F. R. Soil type and land use effects on percolation of soil water through monolith lysimeters. Soil Sci. Soc. Amer. Proc. 18:358-362,illus.,tables. Oct.1954. 56.9 So3
A summary of data on percolation of soil through monolith lysimeters with an 8-foot profile covering the period 1938 to 1953. The effects of soil type and land use on percolation are stressed.

94. DREIBELBIS, F. R. Some plant nutrient losses in gravitational water from monolith lysimeters at Coshocton, Ohio. Soil Sci. Soc. Amer. Proc. 11:182-188,illus.,tables. Ref. 1946,pub.1947. 56.9 So3
Plant-nutrient losses in drainage water.

95. EDMINSTER, T. W., and VAN SCHILFGAARDE, J. Technical problems and principles of drainage. U. S. D. A. Ybk. Agr. 1955: 491-498. I Ag84Y
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96. EDMINSTER, T. W., and others. Tests of small core samplers for permeability determinations. Soil Sci. Soc. Amer. Proc. 15: 417-420,illus.,tables. 1950,pub.,1951. 56.9 So3
W. L. Turner, J. H. Lillard, and F. Steele, joint authors.
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A study of the influence of precipitation, the permeability and capillarity of the soil, the drain-distance, the drain diameter, and the pressure in the drains.

98. EVANS, D. D., KIRKHAM, D., and FREVERT, R. K. Infiltration and permeability in soil overlying an impermeable layer. Soil Sci. Soc. Amer. Proc. 15:50-54,illus. 1950,pub.,1951. 56.9 So3
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99. FREE, G. R., BROWNING, G. M., and MUSGRAVE, G. W. Relative infiltration and related physical characteristics of certain soils. U. S. D. A. Tech. B. 729,52 p.,illus.,tables. July 1940. Ref. 1 Ag84Te
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100. GARDNER, W. The influence of soil characteristics on drainage and irrigation practices. Soil Sci. Soc. Amer. Proc. 1:383-

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Abstract of thesis (Ph. D)— Cambridge University, England.

102. GUSTAFSON, A. F. Drainage, plowing, seedbed preparation and cultivation in New York. N. Y. Agr. Col. Cornell Ext. B. 183,rev., 32 p.,illus. Mar. 1945. 275.29 N48E
The subjects discussed under drainage are: Granulation, aeration, absorption of water, erosion, heaving, soil temperature, available moisture, and preparation of plant nutrients.

103. HANKS, R. J., HOLMES, W. E., and TANNER, C. B. Field capacity approximation based on the moisture-transmitting properties of the soil. Soil Sci. Soc. Amer. Proc. 18:252-254,illus.,table. July 1954. Ref. 56.8 So3
A new field capacity approximation is reported as the result of tests made in connection with irrigation, hydrologic, and drainage investigations at the University of Wisconsin.

104. HARPER, H. J., and ROSE, L. E. Effect of silt on natural vegetation and drainage in the flood plain of Deep Fork of the North Canadian River, Lincoln County, Oklahoma. Okla. Acad. Sci. Proc. 24:80-82,table. 1943. 500 Ok42

105. HARROLD, L. L., and DREIBELBIS, F. R. An accounting of the daily accretion, depletion, and storage of soil-water as determined by weighing monolith lysimeters. Amer. Geophys. Union. Trans. 26:283-297,illus.,tables. Oct.1945. Ref. 330.9 Am3
Discussion, p. 292-297.
Data from two soil types are given for a one-year period. Graphs of daily precipitation and condensation are presented as a measure of accretion, and graphs of daily evapotranspiration, percolation, and runoff present data of the depletion process.

106. HARROLD, L. L. Land-use practices on runoff and erosion from agricultural watersheds. Agr. Engin. 28:563-566,illus.,tables. Dec.1947. 58.8 Ag83
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107. HARROLD, L. L. Use of soil porosity for water conservation. Agr. Engin. 33:287-289,292,illus.,tables. May 1952. 58.8 Ag83
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108. HEATHCOTE, W. R. A soil survey of Warpland in Yorkshire. J. Soil Sci. 2:144-162,tables. July 1951. Ref. 56.8 J823
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109. HOBBS, H. W. Rates of runoff in the coastal plains of New Jersey, Delaware, and Maryland. U. S. Soil Conserv. Serv. SCS-TP-60,60 p.,illus.,map,tables. July 1946. 1.96 Ad6Tp
For use in planning for drainage of small areas.

110. HOCKENSMITH, R. D., and STEELE, J. G. Classifying land for conservation farming. U. S. D. A. Farmers' B. 1853,46 p., illus.,tables. Feb.1943. I Ag84F
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111. HOOGHOUDT, S. B. Bijdragen tot de kennis van eenige natuurkundige grootheden van den grond. 7. Algemeene beschouwing van het probleem van de detailontwatering en de infiltratie door middel van parallel loopende drains, greppels, slooten en kanalen. Netherlands. Dir. van de Landb. Verslagen van Landbk. Onderz. 46(14)B:

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112. HOOGHOUDT, S. B. Bijdragen tot de kennis van eenige natuurkundige grootheden van den grond. 8. De bodemgesteldheid van de Veenkoloniën; de doorlatendheid van de watervoerende laag tot maximal 20 M. onder het maaiveld, en de daaruit af te leiden algemeene conclusies met betrekking tot de ontwatering van de Veenkoloniën. Netherlands. Dir. van de Landb. Verslagen van Landbk. Onderz. 49(16)A:721-914,illus.,tables. 1943. 105.2 V61V

The composition of the soil of the Fen counties; the permeability of the water-bearing stratum to a maximum depth of 20 metres under the meadow, and the conclusions to be drawn therefrom regarding the drainage of the Fens.

113. HUBERTY, M. R. The drainage and permeability characteristics of soils on which avocado tree decline and collapse are prevalent. Calif. Avocado Soc. Ybk. 1943:38-40. 81 C128

Surface drains and subdrains, or both, can be used in reducing excessive moisture in soils of reasonable depth.

114. HURSH, C. R., HOOVER, M. D., and FLETCHER, P. W. Studies in the balanced water-economy of experimental drainage-areas. Amer. Geophys. Union. Trans. 23:509-517,illus.,tables. Nov. 1942. 330.9 Am3

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115. IRMAY, S. Saturated steady flow in non-homogeneous media and its applications to earth embankments, wells, drains. Internatl. Conf. Soil Mech. & Found. Engin. 3rd. Proc. 2:259-263,illus. 1953. Ref. 290.9 In863

A formula is developed for a horizontal drainage ditch and found to be identical with that for homogeneous soils with average resistivity. When two ditches drain a uniform rainfall, the water table is no longer elliptic.

116. JAKOVLEV, B. I. Soil permeability over drains and between drains. (In Russian.) Vzesoiuzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 3:44-48,tables. 1940. 20 Ak1

The soil above drains has greater permeability at all times than the soil between the drains.

117. JONES, L. A. Drainage in relation to soil and moisture conservation. Washington, U. S. Soil Conserv. Serv.,1939. 9 p. 1.96 R31J

Paper presented before the Soil and Water Conservation Division of the American Society of Agricultural Engineers, Chicago, Dec. 7, 1939.

118. KIDDER, E. H., and LYTLE, W. F. Drainage investigations in the plastic till soils of northeastern Illinois. Agr. Engin. 30:384-386,389,illus.,tables. Aug.1949. Ref. 58.8 Ag83

Both surface and tile drainage are discussed. Investigation indicates that considerable variation in the permeability rates may exist in the same soil type.

119. KIRKHAM, D., and GASKELL, R. E. The falling water table in tile and ditch drainage. Soil Sci. Soc. Amer. Proc. 15:37-42, illus. 1950,pub.,1951. Ref. 56.9 So3

An equation for the rate of fall of a water surface is derived in terms of the hydraulic head function, the slope of the water table, the soil permeability, and drainable porosity. The computation method developed requires considerable labor to obtain accurate results when the spacing between drainage facilities is large.

120. KIRKHAM, D., and ZEEUW, J. W. DE. Field measurements for tests of soil drainage theory. Soil Sci. Soc. Amer. Proc. 16: 286-293,illus.,tables. July 1952. Ref. 56.9 So3

Measurements are reported for water-table heights, rainfall, permeability, and of ditch and draintile outflow, for tile drains and ditch drains in replicated plots in the recently reclaimed Northeast Polder of the Netherlands. It was found that tiles kept the water table lower at all times than did the ditches.

121. KIRKHAM, D. Reduction in seepage to soil underdrains resulting from their partial embedment in, or proximity to, an impervious substratum. Soil Sci. Soc. Amer. Proc. 12:54-59,illus. 1947. Ref. 56.9 So3

Concludes that drains should not be placed too near, on, or in an impervious layer if a rapid initial drawdown of the water table is desired

122. KIRKHAM, D. Seepage into ditches in the case of a plane water table and an impervious substratum. Amer. Geophys. Union. Trans. 31:425-430,illus. June 1950. Ref. 330.9 Am3

Seepage of water into drain tubes. Streamlines, distribution of hydraulic head, and the seepage rate into unit length of ditch are computed.

123. KIRKHAM, D. Seepage into drain tubes in stratified soil. Amer. Geophys. Union Trans. 32:422-442. June 1951. Ref. 330.9 Am3

Expressions for drain flow, surface inflow distribution, and flow nets are derived for surface water seeping into drain tubes embedded in water-saturated soil. Drains both in and below the surface stratum are considered.

124. KIRKHAM, D. Seepage of artesian and surface water into drain tubes in stratified soil. Amer. Geophys. Union Trans. 35:775-790. Oct.1954. 330.9 Am3

The problem of simultaneous upward seepage of water from an artesian basin and downward seepage from a ponded surface source into drain tubes is analysed for soil consisting of two horizontally stratified layers, each of different permeability, overlying artesian gravel. Theoretical formulas for hydraulic head, drain flow, and surface inflow distribution are given.

125. KIRKHAM, D. Studies of hillside seepage in the Iowan Drift area. Soil Sci. Soc. Amer. Proc. 12:73-80,illus. 1947. Ref. 56.9 So3

Drainage studies of three hillside problem areas typical of the region—a hillside, a tiled area, and an artesian area. It was found that hillside drainage difficulties were due to upward movement of the water resulting from artesian pressure developed by downward seepage over the upper portion of the hill.

126. KNOBLAUCH, H. C., and HAYNES, J. L. The effect of contour cultivation on runoff. Washington,U. S. Soil Conserv. Serv.,1940. 12 p.,illus. 1.96 R31Ef

New Jersey Agricultural Experiment Station, cooperating.

Facts to be considered in planning erosion and flood control measures for watersheds or for individual farms. Hydrographs are presented showing comparison of rate of flow, surface detention, and depression-storage of contoured up-and-down tillage practices under various conditions of soil moisture.

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127. KNOBLAUCH, H. C., RICHARDS, S. J., and LINT, H. C. Soil moisture tension under various conservation practices. Soil Sci. Soc. Amer. Proc. 4:433-437; 6:480-483,illus.,table. 1939, 1941. 56.9 So3

Effect of terracing given.

128. KOHNKE, H. Runoff chemistry, an undeveloped branch of soil science. Soil Sci. Soc. Amer. Proc. 6:492-500,illus. 1941. Ref. 56.9 So3

Discusses the loss of nutrients involved in ground-water runoff and tile-drainage water.

129. KRIMGOLD, D. B., and BEENHOUWER, O. Estimating infiltration. Agr. Engin. 35:719-725,illus.,tables. Oct.1954. Ref. 58.8 Ag83

Mathematical formulas for estimating the moisture in soils in connection with drainage, irrigation, runoff, and tillage.

130. LAMBERT, J. M. A survey of the Rockland-Claxton Level, Norfolk. J. Ecol. 36:120-135,illus.,maps,tables. July 1948. 450 J829

Vegetation, soils, and drainage conditions of an embanked and drained grazing area in the Yare Valley of England.

131. LEMBKE, W. D. The mathematical analysis and experimental tests of a tile drainage model. Urbana,Ill.,1952. 47 p.,illus., tables. Ref. U. Ill. Libr.

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Thesis (M. S.)- University of Illinois, 1952.

Southwell's relaxation method is used to solve soil profiles with variable permeabilities. The effects of drain diameter, unsymmetrical drain sections, and the position and thickness of a slowly permeable layer are discussed also.

132. LEVI, E. Coeficiente de riego y coeficiente de drenaje. Ingen. Hydraul. en Méx. 5(1):9-19,illus. Jan./Feb./Mar.1951. 290.8 In43

Technical discussion of irrigation, drainage, runoff and ground water in Mexico.

133. LOWDERMILK, W. C. Land-use and flood-flows. Amer. Geophys. Union Trans. 19:508-515,illus. Aug.1938. 330.9 Am3

Concentrations of unabsorbed waters of drainage channels into trunk streams under variable rain patterns and the accumulation of erosional debris in stream channels.

134. LUTHIN, J. N., and GASKELL, R. E. Numerical solutions for tile drainage of layered soils. Amer. Geophys. Union Trans. 31: 595-602. Aug.1950. Ref. 330.9 Am3

Discussion in Amer. Geophys. Union Trans. 32:779-780. Oct.1951. 330.9 Am3

The problem of tile drainage of uniform soil lying above an impermeable layer. Tile drainage of 2-layered soil with surface soil used for trench backfill is dealt with numerically.

135. LUTHIN, J. N., and MILLER, R. D. Pressure distribution in soil columns draining into the atmosphere. Soil Sci. Soc. Amer. Proc. 17:329-333,illus. Oct.1953. Ref. 56.9 So3

Columns of soil were wetted and then allowed to drain, while measurements were made of the pressure distribution in the soil and of the rate at which the water drained out. The experimental results emphasize the importance in drainage of the tension required to produce entry of air into the soil surface.

136. LUTHIN, J. N. Proposed method of leaching tile-drained land. Soil Sci. Soc. Amer. Proc. 15:63-68,illus. 1950,pub.,1951. Ref. 56.9 So3

Where soils are drained by tile, it is difficult to leach all of the soils adequately. It is proposed that a diking arrangement be used so that certain selected surface areas can be ponded while other surfaces remain dry.

137. LYON, A. V. Irrigation and drainage investigations. So. Austral. Dept. Agr. J. 44:732-734. July 1941. 23 So84

The nature of the soil profile controls the depth of drains which are seated if possible on clay subsoil. In soils with a free-textured subsoil drains are usually five to six feet deep. Spacing of drains is determined by recording the fluctuations of the water table in a line at right angles to the drains. On heavy soils it is found that surface drainage gives better results.

138. MACINTIRE, W. H., and others. Effect of fluorine carriers on crops and drainage waters. Indus. & Engin. Chem. 43:1797-1799, tables. Aug.1951. Ref. 381 J825

S. H. Winterberg, I. B. Clements, L. S. Jones, and B. Robinson, joint authors.

Concludes that rational uses of fluoric insecticides do not induce significant enhancement in fluorine content of vegetation, nor do such uses impart to ground water a harmful concentration of fluorides.

139. MARIMPIETRI, L. A new conception of land tillage, settlement and drainage. Internatl. Cong. Soil Sci. 4th Trans. 3:13-17,illus. 1950. 56.09 In844

Contends that ditch drainage has no bearing on water in the soil if subsoil is not settled or if walls of the ditch are sound.

140. MASCLEE, J. A. De ontwateringseisen van humueze gronden. Landbk. Tijdschr. 65:402-410,illus. July 1953. 105.2 Or3

English summary, p. 410.

The optimal drainage depth of humus-containing sandy soils.

141. MEINZNER, O. E., and others. The channel-storage method of determining effluent seepage. Amer. Geophys. Union Trans. 17: 415-418. July 1936. 330.9 Am3

R. C. Cady, R. M. Leggette, and V. C. Fishel, joint authors.

The results of an investigation on a small drainage basin in Virginia.

142. MERRILL, L. P. Some agricultural engineering problems in soil and water conservation. Agr. Engin. 32:481-482,illus. Sept. 1951. 58.8 Ag83

Water-disposal system for sloping cultivated land in the Western Gulf region (Texas, Oklahoma, Arkansas and Louisiana.) Chiefly runoff from terraces.

143. MOLEN, W. H. VAN DER. Bepaling van drainafstanden door een morphologische beoordeling van het bodemprofiel. Landbouwk. Tijdschr. 65:105-113,illus.,tables. Feb./Mar.1953. 105.2 Or3

Determination of drain spacing by a morphological evaluation of the soil profile. Drainage calculation methods used for sandy soils of the Zuiderzee are outlined.

144. MORGAN, M. F., JACOBSON, H. G. M., and LECOMPTE. S. B. Drainage water losses from a sandy soil as affected by cropping and cover crops. Conn. (New Haven) Agr. Expt. Sta. B. 466,32 p., illus.,tables. Oct.1942. Ref. 100 C76St

Lysimeter studies involving the effects of cropping, cover crops, and nitrogenous fertilizers with reference to drainage water losses and the removal of various constituents by crops and soil changes.

145. NEAL, J. H. Relation of drainage to erosion control. Minn. Agr. Engin. News Let. 78,1 p. Sept.15,1938. 287.29 M66Ag

A well drained soil will lose by surface runoff only one-third as much as a saturated soil. Both tile and terrace drainage are discussed.

146. NELLER, J. R., and FORSEE, W. T., JR. Installation of lysimeters in the peat soil of the Florida Everglades. Soil Sci. Soc. Fla. Proc. 3:102-106,illus. 1941. Ref. 56.9 So32

Details of the installation are given, including a subirrigation device which provides the type of subirrigation at controlled water-table levels practiced in cultivated lands of the Everglades.

147. NELSON, L. B., and MUCKENHIRN, R. J. Field percolation rates of four Wisconsin soils having different drainage characteristics. Amer. Soc. Agron. J. 33:1028-1036,illus.,tables. Nov.1941. Ref. 4 Am34P

Field percolation rates were determined on undisturbed soil profiles of two poorly drained and two well-drained Wisconsin soils by means of a buffer compartment method. Results correlated well with the characteristics of the soil profiles and explain to a large extent the differences in cropping and drainage conditions found on these soils.

148. NELSON, W. R., and BAVER, L. D. Movement of water through soils in relation to the nature of the pores. Soil Sci. Soc. Amer. Proc. 5:69-76. 1940. 56.9 So3

Research in Ohio indicates that permeability of soils is related to volume of the pores drained at the flex point.

149. OCHOA, A. E. Pérdidas de nutrientes en los suelos, causadas por remoción en las cosechas y en las aguas de drenaje. Caracas,El Compás,1949. 38 p.,tables. Ref. 56.6 Oc3

Losses of soil nutrients in drainage waters are discussed. Venezuela.

150. ODELIEN, M., and VIDME, T. Lysimeterforsk på Ås, 1938-43, Norges Landbrgsk. Meld. 25:273-362,illus.,tables. 1945. 104 N762M

Lysimeter experiments at Ås. The quantities of N, P, K, Ca, S, and Cl removed in the drainage waters and in potato crops were measured in six lysimeters. Norway.

151. OVERY, B. B. The application of soil mechanics to a study of mole draining. (Abs.) Cambridge U. Abs. Diss. 1952/53:67-68. 241.8 C14

The action of the mole and blade of a mole plow in relation to the mechanical properties of soils.

152. PATTY, R. L. How to determine the drainability of soils. Agr. Engin. 25:221-222,illus. June 1944. 58.8 Ag83

Hydrometer-analysis technique is outlined and the significance of clay colloids in relation to drainability is discussed.

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Sect. D. Floods of May-July 1950 in southeastern Nebraska.
Sect. E. Floods of 1950 in southwestern Oregon, northwestern California.
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Sect. G. Floods of 1950 in the Upper Mississippi River and Lake Superior Basins in Minnesota.
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Appendix 8, Statement of Task Committee No. 8 on Land Drainage, p. 177-187, discusses legislation, policy, and costs, and makes recommendations for future policy in relation to land drainage.

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329. ISRAELSEN, O. W., MAUGHAN, J. H., and HANSEN, E. G. Drainage under the Utah drainage district law. Utah Farm & Home Sci. 7(3):5,16-17,illus. Sept.1946. 100 Ut1F

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338. NATIONAL RESOURCES COMMITTEE. WATER RESOURCES COMMITTEE. New water laws needed in the West. Reclam. Era 30:18-19. Jan.1940. 156.84 R24

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339. NORTH DAKOTA. LAWS, STATUTES, ETC. North Dakota conservation laws: drainage, irrigation, water conservation, miscellaneous. Bismarck?1939. 188 p. 280.7 N81Nd

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Vol. 1, A water policy for the American people; Vol. 2, Ten rivers in America's future; Vol. 3, Water-resources law.

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Drainage, v. 3, p. 315-319, summarizes U. S. legislation in connection with drainage for land reclamation.

342. ROBERTS, J. A. Land drainage. Agr. Inst. Rev. 5(3):21-23. May 1950. 7 Ag8

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344. SMITH, G. E. P. Ground-water law in Arizona and neighboring States. Ariz. Agr. Expt. Sta. Tech. B. 65,48 p.,illus. Dec.1936. 100 Ar4

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Discusses some of the erroneous legal concepts resulting from inadequate comprehension of geologic and hydrologic factors governing occurrence and movement of water underground. Ground-water laws in western United States are referred to.

346. U. S. CONGRESS. HOUSE. COMMITTEE ON AGRICULTURE. Rehabilitation of drainage works; acquisition of land in Ottawa National Forest, State of Michigan. Hearing, 76th Cong., 1st sess., on H. R. 3747 and 931, May 3 and 4, 1939. Washington,1939. 44 p. 280.12 Un332

Hearings on a bill (H. R. 3747) to appropriate $10,000,000 per year for 4 years "to provide for the conservation of agricultural land resources by assisting in the repair, reconstruction, rehabilitation, and improvement of drainage works maintained and operated by an organized public drainage district or similar public body," p. 1.

347. U. S. CONGRESS. HOUSE. COMMITTEE ON IRRIGATION AND RECLAMATION. Amending Reclamation Act to include logged or cut-over lands and swamp lands. Hearings, 78th Cong., 2d sess., on H. R. 3787. Dec. 7, 1944. Washington,1945. 23 p. 54 Un3

Hearings on the advisability of amending the Reclamation Project Act of 1939 to include drainage of wet lands and reclamation of cut-over lands, as well as irrigation of dry lands, as part of the work of the Reclamation Bureau.

348. U. S. CONGRESS. SENATE. COMMITTEE ON AGRICULTURE AND FORESTRY. Construction of drainage works in the United States. Hearings, 78th Cong., 2d sess., on S. 1289, June 5-6, 1944. Washington,1944. 65 p. 54 Un32

A bill to provide that the Department of Agriculture cooperate with districts authorized under State laws to finance, construct, operate, and maintain drainage improvements.

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The Act is reproduced on p. iv-vii.

350. U. S. LAWS, STATUTES, ETC. Federal reclamation laws annotated. Ed. 2. Washington,1947. 766 p.,map. 156.85 F317

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351. U. S. NATIONAL RESOURCES COMMITTEE. WATER RESOURCES COMMITTEE. Drainage policy and projects. Washington, 1936. 22 p.,illus.,maps. 173.2 N214D

The nature of Federal drainage activities, purposes and methods of land drainage, and construction requiring subsequent drainage. Recommends the establishment of a Federal committee, headed by a civilian consultant, to coordinate drainage activities in the United States.

352. U. S. SOIL CONSERVATION SERV. SOUTHEASTERN REGION. General outline for review and study of drainage laws and phy-

sical drainage problems in Georgia. Spartanburg?S. C.,1949. 4 p. 1.9602 G28

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353. U. S. SOIL CONSERVATION SERV. SOUTHWEST REGION. Legal status of New Mexico drainage basins. Albuquerque,1947. 6 p. 1.9608 L52

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354. WERNIMONT, K., AULL, G. H., and CLARK, O. M. Agricultural drainage administration in South Carolina; a proposed postwar drainage program. S. C. State Planning Bd. 13,39 p. 1943. 280.7 So8292B

Includes legislative history and current law, pertaining to drainage, financing, and maintenance problems.

355. WILLIAMS, M. B. Water laws in the United States of America relating to water rights, irrigation, conservation drainage, and flood and overflow protection for agricultural lands; a selected reference list of publications with some reproductions, basic excerpts, and lists of contents of special interest. Washington, Food & Agr. Organ. United Nations,1948. 168 p. 241 F732W

356. WINTON, G. H., JR. Drainage and improvement districts. Calif. Mosquito Control Assoc. Proc. & Papers 20:76-78. 1952. 428 C763

Formation of drainage districts, and a discussion of drainage legislation.

357. YOUNG, G. E. Nature and extent of U. S. Department of Agriculture programs contemplated under the Watershed Protection and Flood Prevention Act. Assoc. West. State Engin. Proc. 27:49-53. 1955. 290.9 As76

A discussion of P. L. 566, 83d Congress, 2d session, 1954.

358. YOUNG, G. E. Watershed protection and flood prevention policies. Washington,U. S. Soil Conserv. Serv.,1955. 6 p. 1.941 A2Y82

Speech at the Northeastern Extension Directors Conference, New York City, Mar. 8 and 9, 1955.

A discussion of P. L. 566, 83d Congress, the Watershed Protection and Flood Prevention Act.

SPECIAL PROBLEMS IN DRAINAGE

Irrigated Lands

359. ALBUQUERQUE, H. C. DE. Irrigação e drenagem na zona canavieira de Pernambuco. Lavoura 51:58-61. Dec.1947. 9.2 L39

Irrigation and drainage in the sugarcane region of Pernambuco.

360. ALL-AMERICAN Canal progress. Engin. News-Rec. 118: 258-261,illus. Feb.18,1937. 290.8 En34

Includes discussion of drainage outlets.

361. ALLISON, L. E., and CHRISTIANSEN, J. E. Report on salinity and water table conditions in grapes and dates on Desert Sun Ranch, Coachella Valley, California. U. S. Region. Salinity Lab. Res. Rpt. 8,14 p.,tables. 1944. 1.965 A2R31

The increasing development of problem areas in the irrigated fruit ranches of the valley led to an investigation by the Salinity Laboratory to determine whether the trouble was caused by high salinity, poor

drainage, or both.

362. AMEMIYA, M., ROBINSON, C. W., and COWLEY, E. W. Reclamation of a saline-alkali soil in the Upper Colorado River Basin. Agron. Abs. 47:12. 1955. 241 Am39

363. ANDERSON, T. C. Drainage reclaims Pease bottom farms. Soil Conserv. 17:247-249,254,illus. June 1952. 1.6 So3S
Drainage of irrigated lands in Montana by means of open ditches.

364. ARNDT, F. R. Thirty years of irrigation. So. Austral. Dept. Agr. J. 46:357-366,illus. July 1943. 23 So84
Includes plans for surveys of drainage reserves for the location of a future main-drainage system for the removal of seepage waters. Tile or concrete drains are recommended for heaviest types of land. Depth of drain and type of pipes are discussed.

365. AYERS, H. D. Soil permeability as a factor in the translocation of salts on irrigated land. Sci. Agr. 31:383-395,illus. Sept. 1951. Ref. 7 Sci2
Canal lining and interception drainage are recommended to prevent excessive seepage and high water tables on soils of low permeability.

366. BAILY, P. J. Drainage on irrigated swamp areas. So. Austral. Dept. Agr. J. 44:443. Mar.1941. 23 So84
Primarily mole drainage.

367. BARTELS, L. C. Grading land for irrigation. Victoria Dept. Agr. J. 43:321-327,illus. Aug.1945. 23 V66J
Includes construction and operation of drainage ditches on irrigated land. Australia.

368. BARTRAM, R. Overirrigation plagues Manson district. West. Fruit Grower 10(8):23-24,illus. Oct.1954. 95.8 G762
Includes tile drainage of irrigated orchards in Washington.

369. BENNETT, H. Improved drainage in the Imperial Valley, California. Soil Conserv. 16:135-138. Jan.1951. 1.6 So3S
Research on an unsuccessful project was followed by installing tile drains. Accomplishment is estimated in dollars per acre based on land values for abandoned land, virgin wet land, and cultivated land. Increase in crop production due to drainage is estimated at $30 an acre.

370. BENNETT, H. Water in the ground: too much or too little? Soil Conserv. 16:153-157,illus. Dec.1950. 1.6 So3S
Drainage and levelling of irrigated lands in New Mexico and Colorado. Includes the Rio Grande Drainage District and its program.

371. BIXBY, F. S. Draining cotton fields the easy way. Excavating Engin. 36:196-198,illus. Apr.1942. 290.8 Ex2
Tractor digging of a 14-foot wide drainage ditch 5 miles long in Arizona irrigated land.

372. BLOODWORTH, M. E., and ROSS, P. E. Drainage of irrigated lands in the Lower Rio Grande Valley of Texas. Agr. Engin. 32: 669-671,673,illus. Dec.1951. Ref. 58.8 Ag83
Unwise use of irrigation water has contributed to salinity. Recommendations for preventive and relief measures are given.

373. BLOODWORTH, M. E. General aspects of drainage and irrigation in the Lower Rio Grande Valley of Texas. Lower Rio Grande Val. Citrus & Veg. Inst. Proc. 3:2-6. 1948. 81 L95
Six relief measures are listed for the local drainage and salinity problems.

374. BOL'SHAKOV, A. F. Soils of the saline complex in the northwestern part of the near-Caspian Lowlands and methods for their reclamation. (In Russian.) Pochvovedenie 11:1-13. Nov.1954. Ref. 57.8 P34
Irrigated soils.

375. BRENNER, W. W. Storm drainage structures, Gila Gravity Main Canal. Reclam. Era 35-36,illus. Feb.1941. 156.84 R24

Description of several automatic spillways, wasteways, and overchutes for disposal of storm waters of creeks and washers.

376. CAMERON, A. E. Over-watering citrus trees. Citrus News 23:45. Mar.31,1947. 80 C494

Even after tiles have been installed, occasional soil auger checks are necessary to detect waterlogging of citrus roots.

377. CHAPPLE, L. A. Drainage. So. Austral. Dept. Agr. J. 46: 333-334. June 1943. 23 So84

Under a community system of irrigation at Berri soil deterioration has been caused by faulty drainage and land has gone out of production through salt accumulation. An effective system of main drains is necessary to take water right away after tile drainage. Recommendations are made for establishing proper drainage systems on different types of soils.

378. CHRISTIANSEN, J. E. Some permeability characteristics of saline and alkali soils. Agr. Engin. 28:147-150,illus.,tables. Apr. 1947. 58.8 Ag83

The success of drainage and leaching of irrigated soils is dependent upon the permeability of the soil and subsoil materials.

379. CLYDE, G. D. Relating basic resources in irrigation research. Agr. Engin. 33:277-278,illus. May 1952. 58.8 Ag83

Includes drainage of irrigated lands. Excess applications of irrigation water, together with seepage from canals and natural channels, causes waterlogging or salt accumulation.

380. DEBLER, E. B. Conveyance losses in irrigation canals. Civ. Engin. 11:584-585,illus. Oct.1954. 290.8 C49

Artificial drainage may provide a remedy for loss due to seepage.

381. DIEBOLD, C. H. Permeability and intake rates of medium textured soils in relation to salt content and degree of compaction. Soil Sci. Soc. Amer. Proc. 18:339-343,illus.,tables. July 1954. Ref. 56.9 So3

Experiments conducted in Arizona, Colorado, New Mexico, and Utah from 1948 through 1953 in order to aid in the design of effective drainage systems for irrigated lands.

382. DONNAN, W. W., and BRADSHAW, G. B. The disposal of seepage and waste water. U. S. D. A. Ybk. Agr. 1955:557-564. 1 Ag84Y

Drainage of irrigated lands in the Western States.

383. DONNAN, W. W. Model tests of a tile-spacing formula. Soil Sci. Soc. Amer. Proc. 11:131-136,illus.,tables. 1946,pub.,1947. 56.9 So3

Formula applicable to drainage of irrigated lands, California.

384. DONNAN, W. W., ARONOVICI, V. S., and BLANEY, H. F. Report on drainage investigation in irrigated areas of Imperial Valley, California. Los Angeles,U. S. Soil Conserv. Serv.,1947. various paging,illus.,tables. Ref. 1.96 R31Red

The objectives of the study were to: "Establish criteria by which the feasibility of drainage on any lands within the Imperial Irrigation District may be determined; where drainage is feasible to establish methods of designing and installing practical drainage facilities; and to develop techniques for improving irrigation practices," Summary, p. xiv.

385. DOWD, M. J. Silt problems of Imperial Irrigation District as affected by completion of Boulder Dam. Civ. Engin. 9:609-611. Oct.1939. 290.8 C49

Growth of moss in drainageways has increased and may become a problem, while erosion due to seepage is increasing. California.

386. DUMM, L. D. Drain-spacing formula. Agr Engin. 35:726-730,illus. Oct.1954. 58.8 Ag83

A new formula for determining depth and spacing of subsurface drains in irrigated lands.

387. DUNNEWALD, T. J. Removal of alkali by drainage and leaching; restoring fertility of alkali soil by means of drainage and leaching at moderate cost, in Fremont County, Wyoming. Wyo. Agr. Expt. Sta. B. 276,28 p.,illus.,tables. June 1946. 100 W99

388. DUNNEWALD, T. J. Salinity conditions in the Big Horn River during the years 1938 and 1939. Wyo. Agr. Expt. Sta. B. 240, 28 p.,tables. July 1940. 100 W99

A study made by the Montana and Wyoming Agricultural Experiment Stations in cooperation with the U. S. Geological Survey in order to ascertain the quantities of dissolved salts in irrigation waters in the area and the originating points of the salts, in connection with planning for the improvement by drainage of the existing irrigated lands.

389. EMERSON, W. O. Imperial digs out. Country Gent. 106(12):12-13,84-85,illus. Dec.1936. 6 C833

Concerned primarily with irrigation, the All-American Canal, and the flooding of the Colorado River in 1905-7. The need for proper drainage to correct the errors of over-irrigation is pointed out.

390. FITZHUGH, E. A. Goldbergian gadget may boost Valley's output. Soil Conserv. 9:228-231,illus. Apr.1944. 1.6 So3S

An apparatus for taking soil cores as a first step in search of solutions to the drainage problems in the irrigated Imperial Valley of California.

391. FLOTEN, C. G. Use of dynamite in constructing drainage ditches. Agr. Educ. Mag. 19:178. Mar.1947. 275.8 Ag8

In irrigated land in Oregon, where the saturated condition of the soil would not support heavy ditching equipment.

392. FUHRIMAN, W. U., BLANCH, G. T., and STEWART, C. E. An economic analysis of the agricultural potentials of the Weber Basin Reclamation project, Utah. Utah. Agr. Expt. Sta. Spec. Rpt. 7,39 p., map,tables. Dec.1952. 100 Ut1Sp

The Utah Agricultural Experiment Station and the U. S. Bureau of Agricultural Economics, cooperating.

Land classification, drainage, irrigation, and water requirements.

393. GAINES, H. F. Managed water brings good times. Soil Conserv. 19:250-251,illus. June 1954. 1.6 So3S

Irrigation and drainage in Washington.

394. GARDNER, R. Some soil properties related to the sodium salt problem in irrigated soils. U. S. D. A. Tech. B. 902,28 p.,tables. Sept.1945. Ref. 1 Ag84Te

Drainage to remove accumulated salts is a necessary step in the improvement of saline soils. Treatment to improve the permeability of the soil may be necessary before drainage can be undertaken.

395. GEDDES, J. A., FREDERICKSON, C. D., and BERGESON, E. C. Drainage and irrigation, soil, economic, and social conditions, Delta area, Utah. Division 4, Social conditions. Utah. Agr. Expt. Sta. B. 288,93 p.,illus.,tables. June 1939. 100 Ut1

Divisions 1,2, and 3 appeared as Bulletins 255,256, and 273. Apr.-May 1935, Oct. 1936.

396. GONZALEZ, R. A. Irrigation in Puerto Rican cane fields. Facts Sugar 35:52-55,illus. Feb.1940. 65.8 F11

Drainage ditches are needed where water is applied by partial flooding.

397. GREGOR, H. F. The Southern California water problem in the Oxnard area. Geog. Rev. 42:16-36,illus.,maps,tables. Jan.1952. Ref. 500 Am35F

Primarily irrigation, but includes drainage of irrigated lands, and ground water.

398. HARDMAN, G., VENSTROM, C.. and MASON, H. G. Irri-

gated lands of the Humboldt River area. Nev. Agr. Expt. Sta. Irrig. B. 1,36 p.,illus.,maps,tables. May 1939. 100 N415
Includes underground water in Nevada, and drainage of irrigated lands.

399. HART, R. A. The drainage of irrigated farms. U. S. D. A. Farmers' B. 805,32 p.,illus. Rev. Dec.1937. 1 Ag84F
Covers open-ditch and tile drainage, depth, spacing and location of tile drains, flumes, wells, inlets, and outfalls, beneficial effects on crops of drainage, maintenance of the drainage system, and costs.

400. HART, R. A. Need for drainage of irrigated farms. Irrig. Farmer 3(5):3,5,10-11. Sept.6,1945. 55.8 Ir78
For prevention of waterlogging and of accumulation of alkali.

401. HAYWARD, H. E. The control of salinity. U. S. D. A. Ybk. Agr. 1943/47:547-553. 1947. Ref. 1 Ag84Y
Good drainage is essential. Where artificial drainage is necessary, three methods are used—tile systems, open drains, and pumped wells. In many places drainage water pumped from wells is mixed with irrigation water and used over again.

402. HAYWARD, H. E., and WADLEIGH, C. H. Plant growth on saline and alkali soils. Advn. Agron. 1:1-38. 1949. Ref. 30 Ad9
Discusses the effects of salinity on various crops and plants, and states that over-irrigation in arid regions "may accelerate the rise of the water table unless provision is made for adequate drainage," p. 3-4.

403. HAYWARD, H. E., and MAGISTAD, O. C. The salt problem in irrigation agriculture. U. S. D. A. Misc. P. 607,27 p.,illus. Aug. 1946. 1 Ag84M
Stresses the importance of good drainage of irrigated lands.
Publications of the U. S. Regional Salinity Laboratory, p. 25-27.

404. HOLBROOK, W. Irrigation from pumped wells; underground water sources increasing in importance as unappropriated surface supplies dwindle. Civ. Engin. 7:473-474,illus. July 1937. 290.8 C49
Describes a drainage system to collect surface water for a well in a shallow deposit.

405. HUBBLE, G. D., and CROCKER, R. L. A soil survey of the Red Cliffs Irrigation District, Victoria. Austral. Council Sci. & Indus. Res. B. 137,63 p.,illus.,maps, tables. 1941. 514 Au72B
Includes drainage of irrigated lands, and salt removal.

406. HUBERTY, M. R., and PILLSBURY, A. F. Reclamation of saline soils in Coachella Valley, Calif.,U. S. A. Internatl. Cong. Soil Sci. 4th. Trans. 1:383-385,table. 1950. 56.09 In844
Leaching experiments on trial plots indicate that only through careful irrigation and drainage practices will a proper salt balance be maintained in the valley.

407. ISRAELSEN, O. W. Drainage in the Lewiston area,Utah. Utah. Agr. Expt. Sta. Spec. Rpt. 9,25 p.,illus.,maps,tables. Ref. 1953. 100 Ut1Sp
Studies made by the Utah Agricultural Experiment Station with the purpose of developing improvements in the design, placing, and maintenance of tile drains, and to find the conditions under which, and the extent to which, drainage by pumping may be preferable to drainage by gravity, in a subirrigated area.

408. ISRAELSEN, O. W. Drainage of irrigated lands. In his Irrigation principles and practices, ed. 2, p. 268-283,illus.,tables. New York, Wiley,1950. Ref. 55 Is7
Section heads include: Benefits of drainage; Required water-table depths; Lowering the water table; Design of open drains; Construction methods and costs; Tile drainage systems; Installation of tile drains; Maintenance of drains; Drain depths, spacing, and ground-water flow; Pumping for drainage; and Drainage enterprises.

409. ISRAELSEN, O. W., and STEWART, C. D. Draining Lewiston flats will improve land conditions in Cache County [Utah]. Sugar Beet 9(8):10-13, 29,illus. Dec.1950. 66.8 Su34B

For growing sugar beets. Open-ditch, underdrainage with tile and control gates, and shallow-well pumping are used. Tile drainage is considered most satisfactory here.

410. ISRAELSEN, O. W., PETERSON, D. F., JR., and REEVE, R. C. Effectiveness of gravity drains and experimental pumping for drainage, Delta area, Utah. Utah. Agr. Expt. Sta. B. 345,64 p.,illus. Feb.1950. Ref. 100 Ut1

U. S. Regional Salinity and Rubidoux Laboratories, cooperating.

Results of studies made on eight irrigated experimental sites between 1945 and 1948.

411. ISRAELSEN, O. W., MAUGHAN, J. H., and SOUTH, G. P. Irrigation companies in Utah; their activities and needs. Utah. Agr. Expt. Sta. B. 322,62 p.,illus.,maps,tables. Mar.1946. 100 Ut1

One of the most needed improvements in irrigation is the draining of saturated soil formations to stabilize canal beds.

412. ISRAELSEN, O. W. Problems peculiar to irrigation farming. Agr. Engin. 18:437-439,illus. Oct.1937. 58.8 Ag83

Includes alkali control and drainage.

413. ISRAELSEN, O. W. Water application efficiencies in irrigation and soil conservation. Agr. Engin. 20:423-425,illus. Nov.1939. 58.8 Ag83

Drainage is considered. Utah.

414. JESSUP, L. T. Irrigated lands require drainage. Internatl. Soc. Soil Sci. Comn. Trans. 6B:271-274. 1937,pub.,1938. 56.9 In833

Salinity of irrigation waters and the need for drainage of irrigated land.

415. JONES, B. J. Irrigated pastures in California. Calif. Agr. Col. Ext. C. 125,47 p.,illus.,tables. Oct.1942. Ref. 275.29 C12C

Includes cost of drainage.

416. KAHAWITA, R. Waterlogging of irrigated lands and remedial measures. Trop. Agr. 95:278-287. Nov.1940. 26 T751

The importance of drainage in irrigation schemes is stressed. Drainage of surface flow, control of subsoil flow, and prevention or reduction of soil alkalinity by drainage are considered. Rhodesia.

Also in Rhodesia Agr. J. 38:302-313. June 1941. 24 R34

417. KELLEY, W. P. Alkali soils; their formation, properties and reclamation. New York,Reinhold,1951. 176 p.,illus.,tables. Ref. 56.33 K28

Selected bibliography, p. 163-170.

Reclamation of alkali soils, p. 131-161.

Drainage by open ditches, tiles, and pumping from wells, is discussed.

418. KELLEY, W. P. Permissible composition and concentration of irrigation water. Amer. Soc. Civ. Engin. Trans. 106:849-861. 1941. 290.9 Am3

Discussion, by C. S. Scofield, W. W. Weir, R. S. Stockton, L. D. Batchelor, and E. B. Debler, p. 856-861.

Since it is necessary to apply saline irrigation water in quantities in excess of crop requirements, in order that some leaching of the root zone will take place, the maintenance of good drainage conditions in the soil is very important.

Also in Amer. Soc. Civ. Engin. Proc. 66:607-613. Apr.1940. Ref. 290.9 Am3P

419. KELLEY, W. P. The reclamation of alkali soils. Calif. Agr. Expt. Sta. B. 617,40 p.,illus.,tables. Dec.1937. Ref. 100 C12S

Experiments on over-irrigated soils of the Western States include drainage and the application of gypsum.

420. KOSTIAKOV, A. Drainage on irrigated lands. (In Russian.) Khlopkovodstvo 1:70-76. Jan.1952. 72.8 K522

421. LARSON, C. A. Reclamation of saline (alkali) soil in the Yakima Valley, Washington. Wash. Agr. Expt. Sta. B. 376,39 p.,illus., tables. July 1939. 100 W27E

Insufficient subsoil drainage had caused deposits of salts from irrigation water in certain areas of the valley, which could not be removed by later installed drains because the salts that had accumulated in the root zone were not leached out after drainage was provided.

422. LEWIS, M. R. Practical irrigation. U. S. D. A. Farmers' B. 1922,69 p.,illus.,tables. Jan.1943. 1 Ag84F

Drainage, p. 68-69.

423. LUNDGREEN, W. K. The human dragline. Reclam. Era 41:65-66,illus. Aug.1955. 156.84 R24

Hand-digging of drainage ditches to relieve seepage due to irrigation on Nebraska farms.

424. LUTHIN, J. N., and BIANCHI, W. Alfalfa and water table levels. Calif. Agr. 8(5):4-5,illus. May 1954. 100 C12Cag

Tile drainage was necessary to counteract the effects of overirrigation and of seepage from the Sacramento River before adequate yields of alfalfa could be achieved.

425. LYON, A. V., and TISDALL, A. L. Production of dried grapes in Murray Valley irrigation settlements. 2. Irrigation, drainage, and reclamation. Austral. Council Sci. & Indus. Res. B. 149,35 p., illus.,tables. 1942. Ref. 514 Au72B

Discusses drainage systems: surface drainage, pumping schemes, gravitational schemes, dual-purpose drains, external and internal drains, drain depth, and distance between laterals. All in relation to soil profile and texture.

426. MCALLISTER, L. Drainage and irrigation in the Willamett Valley. Reclam. Era 34:175-177,illus. Sept.1948. 156.84 R24

Oregon.

427. MCCORMICK, J. A., and NAPHAN, E. A. Improving saline and alkali soils in Nevada. Nev. Agr. Expt. Sta. C. 1,11 p.,illus. Aug. 1952. 100 N41S

Drainage and leaching of irrigated soils.

428. MCLAUGHLIN, W. W. Irrigation and the conservation of the range. Soil Conserv. 4:175-177. Jan.1939. 1.6 So3S

Includes drainage and drainage ditches.

429. MAGISTAD, O. C., and CHRISTIANSEN, J. E. Saline soils, their nature and management. U. S. D. A. C. 707,32 p.,illus. Sept. 1944. Ref. 1 Ag84C

One of the first steps in reclamation of saline soils is good drainage. Tile, open drains, and pumped wells are mentioned.

430. MAIERHOFER, C. R. The drainage of irrigated lands. Agr. Engin. 32:613-614. Nov.1951. 58.8 Ag83

Chiefly in the Western States. Basic principles are considered. Includes determination of the amount of artificial drainage needed.

431. MAIERHOFER, C. R. Drainage problems in the Rio Grande Valley. Reclam. Era 34:116-118. June 1948. 156.84 R24

The water table, and accumulations of salt in the soil. A four-point program towards solving the problems is suggested, including education of the landowners in the benefits of drainage, and research into the depth, spacing, and type of drains for best results.

Also in Lower Rio Grande Val. Citrus & Veg. Inst. Proc. 2:22-30. 1947,pub.,1948. 81 L95

432. MAIERHOFER, C. R. Some aspects of drainage in reclamation. Internatl. Comn. Irrig. & Drain. Annu. B. 2:83-86. 1953. 55.9 In8A

Speaks of the drainage of irrigated lands in the Western United States, and the function of drainage in removing salts as well as excess water.

433. MALHOTRA, S. L. Nangal Dam and Canal. Punjab (India). Internatl. Comn. Irrig. & Drain. Annu. B. 1:67-76,illus.,maps,tables. 1952. 55.9 In8A

Includes drainage of irrigated lands.

434. MANLY, G. W. Storm-drainage structures on the All-American Canal. Reclam. Era 29;302-305,illus. Nov.1939. 156.84 R24

435. MAUGHAN, J. H., and ISRAELSEN, O. W. Management of irrigation and drainage enterprises in Utah, with special reference to the northern Cache Valley area. Utah Agr. Expt. Sta. B. 349,49 p., illus.,maps,tables. June 1951. Ref. 100 Ut1

Covers relations of irrigation and drainage, drainage methods, drainage enterprises, drainage districts, and landowners attitudes towards irrigation and drainage organizations.

436. MILLER, C. K. Drainage in the Big Horn Basin. Soil Conserv. 20:135-139,illus. Jan.1955. 1.6 So3S

Drainage of 10,000 irrigated acres in Wyoming by open ditches 30 feet wide and 7 to 8 feet deep cost only 18 dollars per acre.

437. MOSS, H. C. Soil surveys of Saskatchewan irrigation projects. Sci. Agr. 20:170-174. Nov.1939. 7 Sci2

The surveys included drainage and topographic conditions as related to soils, and vegetation and land use as related to soil and drainage conditions.

438. NOTES on waterlogging and land reclamation in the form of a questionnaire. India. Cent. Bd. Irrig. P. 17,41 p. Sept.1938. 55.9 In222

Principles of and data on reclamation of waterlogged irrigated lands, and methods of determining suitability of land for reclamation, with special reference to experience in various sections of India.

439. OVER-irrigation. Reclam. Era 26:297. Dec.1936. 156.84 R24

"All irrigated areas require drainage of some kind, either natural or artificial, surface or subsoil, varying only in method and degree."

440. PARIS, R. G. Comprehensive drainage in the River Murray irrigation areas. So. Austral. Dept. Agr. J. 55:571-579,illus., June/July 1952. 23 So84

Includes the Waikerie system, "external" and "internal" drainage, design and layout, construction, costs, sumps and outlets, size of main drains, block connections, and pumping and outfall mains.

441. PENNY, J. M. Irrigação e drenagem. Lav. Arroz. 5(52): 9-10. Apr.1951. 59.8 L39

Irrigation and drainage of rice in Brazil.

442. PETERSON, D. F., JR., and ISRAELSEN, O. W. Performance of existing gravity drains. U. S. Region. Salinity Lab. Res. Rpt. 25(Pt. 1),10 p. Apr.1948. 1.965 A2R31

In order to study the effectiveness of the present system of gravity drains in the Utah Delta area, piezometers for determining the elevations of the water table were installed at four locations where new open drains were being constructed. The paper describes results of the investigation. A continuation of the studies described in item 449, by Reeve, R. C., and Allison, L. E.

443. PILLSBURY, A. F. Drainage and reclamation; network of observation wells in Coachella Valley permits anticipation of possible drainage problems. Calif. Agr. 8(3):3-4,illus. Mar.1954. 100 C12Cag

Coachella County, the U. S. Departments of Agriculture and the Interior, and the University of California cooperate in studies to devise methods of observing ground-water conditions so that drainage problems in the irrigated valley may be forecast in time to prevent serious

damage to land and crop.

444. POE, E. J. Water problems in the Southwest. Soil Conserv. 13:142-144,illus. Jan.1948. 1.6 So3S

Bad irrigation and undiscovered clay substrata have caused waterlogging of soils in New Mexico, Utah, and Colorado. Deep drainage has been the answer.

445. POWERS, W. L. The drainage of irrigated lands. n.p., 1941? 5 p. 55 Or34

Oregon Agricultural College and U. S. Department of Agriculture, cooperating.

Contents: Lands of the arid region needing drainage; Drainage practice in the West; Treatment of drained land; The relation of economical irrigation to drainage.

446. RAE, R. Land drainage in low-rainfall areas. Allahabad Farmer 28:215-219. Nov.1954. 22 A15

Drainage of irrigated lands and of flat areas and depressions in low-lying river beds in arid and semiarid regions. Discusses open ditches, covered drains, and pole, brush, rock, cobble, and tile drains.

447. REEVE, R. C. Factors influencing drainage design in irrigated areas. Agr. Engin. 34:88-90,illus. Feb.1953. Ref. 58.8 Ag83

Drainage requirements, water-transmission properties of soil, and boundary conditions.

448. REEVE, R. C., ALLISON, L. E., and PETERSON, D. F. JR. Improvement of saline soils by leaching. U. S. Region. Salinity Lab. Res. Rpt. 25(Pt. 2),14 p. Apr.1948. 1.965 A2R31

Studies in Utah indicate that adequate drainage is necessary for leaching, and that leaching without sufficient drainage may be detrimental rather than beneficial.

449. REEVE, R. C., and ALLISON, L. E. Performance of gravity drains and leaching of impaired Delta area soils. U. S. Region. Salinity Lab. Res. Rpt. 21:35-54. Feb.1947. 1.965 A2R31

Investigations at the Regional Salinity Laboratory to determine: (1) The actual depths and seasonal fluctuations of the water table in drained areas compared with areas without drains; (2) The effect of the construction of additional drains on the water table in their vicinity; and (3) The lateral extent to which drains are effective.

450. REEVE, R. C., PILLSBURY, A. F., and WILCOX, L. V. Reclamation of a saline and high boron soil in the Coachella Valley of California. Hilgardia 24:69-91. Sept.1955. Ref. 100 C12H

Flushing and leaching irrigated soils.

451. REEVE, R. C., ALLISON, L. E., and PETERSON, D. F. JR. Reclamation of saline-alkali soils by leaching—Delta area, Utah. Utah Agr. Expt. Sta. B. 335,52 p.,illus.,tables. Dec.1948. 100 Ut1

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Literature cited, p. 148-153.

Drainage of irrigated lands in relation to salinity control, p. 41-48.
Describes the reclamation of irrigated soils, which have become saline or alkali, by means of deep open ditches, tile lines, or pumping from wells.
Replaces publication of same authorship and title, issued by the U. S. Regional Salinity Laboratory, 1947. 157 p.,tables. Ref. 1.965 A2D542

454. ROBINS, J. S., PRUITT, W. O., and GARDNER, W. H. Unsaturated flow of water in field soils and its effect on soil moisture investigations. Soil Sci. Soc. Amer. Proc. 18:344-347,illus.,tables. July 1954. Ref. 56.9 So3
An experiment conducted in an attempt to measure the effects of unsaturated flow on the distribution of water following irrigation and of the field capacity of soils.

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Partial contents: Ch. 4, Interrelation of irrigation and drainage; Ch. 5, Fundamental principles of irrigation and problems of agriculture under it.

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457. ROGERS, H. Get the jump on drainage. Farm Mangt. 4:12-14,16-17,illus. Jan.1955. 281.8 F2225
Drainage of irrigated lands in California.

458. ROMERO M., A. La irrigación y el drenaje en la industria azucarera. Agr. Trop. 10(5):25-34,tables. May 1954. 26 Ag8
Irrigation and drainage in sugar culture in Colombia.

459. SCOFIELD, C. S. The Pecos River Joint Investigation, 1939-1940; soil salinity investigation. Washington,U. S. Bur. Plant Indus.,1941. 191 p.,tables. 1.965 I2P33
Excessive salinity in the irrigated soil of the Pecos Valley in New Mexico and Texas is caused primarily by the irrigation water. Among the remedies recommended is the construction of artificial drainage outlets.

460. SCOFIELD, C. S. Salt balance in irrigated areas. J. Agr. Res. 61:17-39,tables. July 1, 1940. 1 Ag84J
The relation between the quantity of dissolved salts delivered to an irrigated area with the irrigation water and the quantity removed from the area by the drainage water.

461. SCOFIELD, C. S. Soil, water supply, and soil solution in irrigation agriculture. U. S. D. A. Ybk. Agr. 1938:704-716. 1 Ag84Y
Lack of appreciation of the need for effective drainage is one of the factors leading to declining crop yields in irrigation agriculture.

462. SCOFIELD, C. S., and HOWE, O. W. Water input used for field crops at the United States Scotts Bluff (Nebr.) Field Station, 1941-44. U. S. D. A. C. 777,18 p.,tables. July 1948. 1 Ag84C
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463. SHARMA, K. R. Drainage works across canals. Indian Engin. 103(2):49-50,illus.,tables. Feb.1938. 290.8 In2
Technical discussion of suction hydrautomats, aqueducts, level crossings, and siphons.

464. SHELAEV, A. Biological drainage in the control of soil salinity in the Main Turkmen Canal zone. (In Russian.) Khlopkovodstvo 3:57-67. Jan.1953. 72.8 K522
Tree planting to control salinity.

465. SPECIAL problems of the Bonneville Basin with reference to ground water. Utah Econ. & Business Rev. 13:(1A):51-56. Oct.

1953. 280.8 Ut1

Extensive areas of the basin's lowlands are unfit for cultivation because of the accumulations of salt. Much of this land can be reclaimed by the quick flushing of fresh water over the surface, dissolving the salts and draining them off to low depressions where they could evaporate.

466. STAFFORD, H. M., and HUBERTY, M. R. Soil characteristics and salinity in relation to irrigation and drainage. United Nations Sci. Conf. Conserv. & Util. Resources. Proc. 4:357-362. 1949, pub.1951. 279.9 Un32P

Two methods of salinity control— one by a physical salt-water barrier, and the other by the repelling action of augmented streamflow— are described. The river discharge for the latter method is indicated and comparison of the two methods as to supplemental water requirements and costs is made.

467. STAMPE, W. Irrigation from the ground water for stimulating food production in desert areas. Empire J. Expt. Agr. 16:47-54. Jan.1948. 10 Em7

Includes schemes for lowering the flood levels in low areas of India by means of drainage pumping.

468. THOMAS, E. E. Reclamation of white-alkali soils in the Imperial Valley. Calif. Agr. Expt. Sta. B. 601,15 p.,illus.,tables. July 1936. 100 C12S

Due to faulty drainage the seepage from irrigation canals has tended to accumulate above the slowly pervious subsoil layers. The consequent high water table has brought the soluble salts to the surface where they have accumulated.

469. THOMAS, J. E. An investigation of the problems of salt accumulation on a Mallee soil in the Murray Valley irrigation area. Austral. Council Sci. & Indus. Res. B. 128,90 p.,illus.,maps,tables. 1939. Ref. 514 Au72B

Drainage, p. 19-20,34-38,48.

470. THOMAS, SIR R. Land drainage in West Pakistan. Agr. Pakistan 1:146-149. 1950. 22 Ag832

Waterlogged lands and saline soils, the result of poor drainage of irrigated lands, are a major problem in Pakistan. Article reviews practices of United States and Egypt.

471. THORNE, D. W., and PETERSON, H. B. Drainage. In their Irrigated soils; their fertility and management, p. 123-129, illus. Philadelphia, Blakiston, 1949. Ref. 56.7 T393

Discusses the need for draining irrigated land, planning a drainage system, depth and spacing of drains, open-ditch, mole, tile, and pump drains, and the design and construction of a drainage system.

472. THORP, J., and SCOFIELD, C. S. Drainage in arid regions. U. S. D. A. Ybk. Agr. 1938:717-722,illus. 1 Ag84Y

Drainage of irrigated lands. Discusses tile drains, knifing, open ditches, and drainage wells, in connection with the character of the soil and the topography.

473. TISDALL, A. L. Drainage of sub-soil water through bores to limestone beds. Commonwealth Engin. 27:59-61,illus.,table. Sept.1,1939. 290.8 C73

A method for draining irrigated areas by means of a shaft drilled down to tertiary limestone strata, where the water is absorbed in the limestone.

474. TISDALL, A. L. Internal drainage investigation in South Australian irrigation districts. So. Austral. Dept. Agr. J. 45:398-402, illus. Feb.1942. 23 So84

Research of major soil types to determine response to agricultural drainage, comparison between drains laid across and laid down the

main slope, depth and spacing of laterals.

475. TISDALL, A. L. A note on the use of drainage water. Austral. Council Sci. & Indus. Res. J. 14:260-263,illus. Nov.1941. 514 Au72J

Australia faces the problem of converting drainage water from the underground tiles of irrigated lands to newly developed agricultural lands in the Murray Valley where water for irrigation is lacking. The drainage waters must first be made salt free.

476. UNIQUE method of drainage devised by San Fernando grower. Calif. Citrog. 24:120,illus. Jan.1939. 80 C125

Stones and straw overcome poor drainage conditions in an over-irrigated lemon grove.

477. U. S. DEPT. OF AGRICULTURE. The salt problem in irrigation agriculture; research at the United States Regional Salinity Laboratory. U. S. D. A. Misc. P. 607,27 p.,illus. Aug.1946. Ref. 1 Ag84M

Good drainage is absolutely essential in removing soluble salts from the soil and in restoring alkali lands to production. Drainage implies a relatively permeable soil and the absence of a water table within a depth where it would influence the water retained in the root zone.

478. VLADIMIROV, A. G. Empirical formula for calculating the distances between drains in irrigated districts. (In Russian.) Vsesoiûzn. Akad. Sel'skokhoz. Nauk im. V. 1. Lenina. Dok. 17(9):44-48. illus.,tables. 1952. Ref. 20 Ak1

479. WALKER, A. W. Drainage of irrigated lands. Civ. Engin. 8:733-734. Nov.1938. 290.8 C49

Drainage to prevent the accumulation of soluble salts that render land sterile.

480. WARDLAW, H. H., and MASON, F. R. An account of irrigation and drainage control on an area of dwarf coconuts. Malayan Agr. J. 24:421-431,illus.,tables. Sept.1936. 22.5 F312

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481. WARNICK, F. M., and GREENHALGH, W. H. Ground water and drainage problems of the Weber Basin project, Utah. Amer. Soc. Civ. Engin. Proc. 81(Separate 619),7 p. Feb.1955. 290.9 Am3Ps

Excessive irrigation has caused drainage problems to develop in the lower areas of the Weber River Basin.

482. WEIR, W. W. Drainage in the San Joaquin Valley as it may be affected by the Central Valley project. Amer. Geophys. Union. Trans. 22:45-49. July 1941. 330.9 Am3

Old drainage situations, now partially alleviated by extensive pumping, will be aggravated to the point where they will again become serious. The whole drainage problem could be solved by withholding late-season gravity water to the extent that 25 or 30 percent of the annual requirement be pumped from deep wells.

483. WOOD, M. N. Almond culture in California. Calif. Agr. Ext. Serv. C. 103,96 p.,illus.,tables. Jan.1937. 275.29 C12C

Water for irrigation is obtained by pumping from drainage ditches. The importance of well-drained soil in irrigated fields is discussed.

Peat and Muck Soils

484. ADAM, J. A modern approach to peat reclamation. New Zeal. Grassland Assoc. Proc. 15:166-173. 1953. 60.19 N48

Tile, mole, and open-ditch drainage of peat lands in New Zealand.

485. ALBERT, A. R. Status of organic soil use in Wisconsin. Soil Sci. Soc. Amer. Proc. 10:275-278,tables. 1945. 56.9 So3

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486. CARNES, A. Agricultural drainage and land use problems in tne Southeastern region. Agr. Engin. 27:74-76,illus. Feb.1946. 58.8 Ag83

The overdrainage of organic (peat) soils in Florida, Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Kentucky, and Tennessee, has resulted in excessive subsidence and the actual burning of the soil. Drainage of inorganic soils is discussed also, and the necessity for making detailed studies of needs and methods before undertaking drainage jobs is stressed.

487. CARPENTER, J. C., and BARBER, E. S. Vertical sand drains for stabilization of muck-peat soils. Amer. Soc. Civ. Engin. Proc. 79(Separate 351),17 p.,illus. Nov.1953. Ref. 290.9 Am3Ps

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488. CLAYTON, B. S., NELLER, J. R., and ALLISON, R. V. Water control in the peat and muck soils of the Florida Everglades. Fla. Agr. Expt. Sta. B. 378,74 p.,illus.,maps,tables. Nov.1942. 100 F66S

The U. S. Soil Conservation Service and the Florida Agricultural Experiment Station, cooperating.

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489. CLAYTON, B. S. Water control in the peat soils of Florida. U. S. D. A. Mimeo. Rpt. 1077,22 p.,illus.,tables. Feb.1938. 1.9 En35Wa

Florida Agricultural Experiment Station and the U. S. Soil Conservation Service, cooperating.

To secure data applicable to peat land in Florida an area bordering Lake Okeechobee on the south was studied with respect to fluctuations of the water table, and amount and rate of subsidence of the land due to drainage.

490. DACHNOWSKI-STOKES, A. P. Peat land in the Pacific Coast States in relation to land and water resources. U. S. D. A. Misc. P. 248,68 p.,illus.,maps,tables. Oct.1936. Ref. 1 Ag84M

Drainage of peat land in the Western States has helped to lower the water table and added greatly to an ever-increasing demand for irrigation.

491. DAVIS, J. F., and HARRISON, C. M. Drainage ditchbank stabilization for organic soils. Soil Sci. Soc. Amer. Proc. 14:283-285,illus. 1949. 56.9 So3

Experiments with grasses and legumes as stabilizers of drainage ditchbanks in peat and muck soils, at Michigan State College's Muck Experiment Farm.

492. DAVIS, J. H. The peat deposits of Florida; their occurrence, development, and uses. Fla. Dept. Conserv. Geol. B. 30,247 p., illus.,maps,tables. Dec.1946. Ref. 406 F66B

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493. DJURLE, O. Torvjordarnas sättning och torriagning—torvjordarnas godaling. Svenska Vallioch Mosskultför. Kvrtlskr. 8:248-254,tables. July 1946. 11 Sv27

Drainage, settling, and fertilization of marshland in Sweden. Subsidence of drained peat lands is often so rapid that a second set of drains must be installed almost immediately after the first.

494. DOGGETT, D. Controlled drainage, Outdoor Ind. 17(6):14-15,illus. June 1950. 279.8 Ou82

Drainage to control the water table in muck and peat soils of Indiana.

495. DRISKELL, B. N., and LYTLE, S. A. Peat and muck types in the lower Mississippi Delta. (Abs.) Assoc. South. Agr. Workers Proc. 50:53-54. 1953. 4 C82

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496. DUFFY, M. Mechanising peat handling. Agr. Mach. J. 8(8):37,illus. Aug.1954. 58.8 Ag86

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497. ELLIS, N. K., and MORRIS, R. Preliminary observations on the relation of yield of crops grown on organic soil with controlled water table and the area of aeration in the soil and subsidence of the soil. Soil Sci. Soc. Amer. Proc. 10:282-283,illus.,tables. 1945. 56.9 So3

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498. ELVEVE, J. T. The Florida Everglades— a region of new settlement. J. Land & Pub. Util. Econ. 19:464-469. Nov.1943. 282.8 J82

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499. GEITMAN, B. G. Relation of degree of peat bog drainage to climatic factors. (In Russian.) Vsesoĭuzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 15(2):43-47. 1950. 20 Ak1

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502. HARKER, D. H. Controlled drainage. Agr. Engin. 22:139-142,illus. Apr.1941. 58.8 Ag83

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504. HARMER, P. M. The muck soils of Michigan; their management and uses. Mich. Agr. Expt. Sta. Spec. B. 314,128 p.,illus., tables. Dec.1941. 100 M58S

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507. JONGEDYK, H. A., HICKOK, R. B., and MAYER, I. D. Changes in drainage properties of a muck soil as a result of drainage

practices. Soil Sci. Soc. Amer. Proc. 18:72-76,illus.,tables. Jan. 1954. Ref. 56.9 So3

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R. B. Hickok, I. D. Mayer, and N. K. Ellis, joint authors.

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511. LUBKOV, A. I. Mechanization of work in drainage and reclamation of peat bogs and marshy lands. (In Russian.) Dostizheniia Nauk. i Peredovogo Opyta v Sel'sk. Khoz. 3:87-88. Mar.1952. 20 D742

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English summary.

Forest drainage in Sweden. Discusses conditions for successful drainage of peatland for afforestation.

514. MATSEPURO, M. E., and ZHILIN, A. P. Kompleksnaia mekhanizatsiia osusheniia bolot i zagotovki torfa na udobrenie. Minsk, Akademiia Nauk BSSR,1954. 186 p. Ref. 58 M42K

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515. MATSEPURO, M. Mechanization of work in drainage and utilization of peat bogs and marshy lands. (In Russian.) Mashinno-Traktornaia Sta. 13(4):3-5. Apr.1953. 58.8 M11

516. M'LAREN, J. The carse of Stirling. Scot. Agr. 33:13-16. Summer 1953. 10 Sco82So

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518. NELLER, J. R., and FORSEE, W. J., JR. A lysimeter for organic soils. Amer. Soc. Agron. J. 34:345-352,illus.,tables. Apr. 1942. Ref. 4 Am34P

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519. NICHOLSON, H. H., ALDERMAN, G., and FIRTH, D. H. An experiment in the control of the ground water level in a Fen peat soil. J. Agr. Sci. 41:149-162,illus.,tables. Jan.1951. Ref. 10 J822

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520. O'CONNOR, R. Bogs and their reclamation. Agr. Ireland

7:177,179-180. Aug.1950. 10.5 Ag8
Converting peat bogs to productive agricultural land in Ireland by drainage.

521. OGG, W. G., and ROBERTSON, I. M. The reclamation of moorland. 1-2. Empire J. Expt. Agr. 2:163-173; 8:56-64. Apr.1934, Jan.1940. 10 Em7
Drainage of peat soils in Scotland by means of open ditches, and by tile, box, and faggot underdrains.

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An account of the character of the peat and the operations carried out, such as draining, liming, manuring, cultivation, and cropping.

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Wet, mucky bottom land in West Virginia is made useful by blasting with dynamite.

524. PUUSTJARVI, V., and JUUSELA, T. On rust precipitates present in drainage pipes and on the means of preventing their formation. Acta Agr. Scand. 2:131-152,illus.,tables. 1952. Ref. 11 Ac82
Technical discussion of field and laboratory trials of drainage on peat soils in Finland.

525. ROE, H. B. The soil moisture and cropping problem of peat and muck lands in the northern United States. Minn. Agr. Expt. Sta. Sci. Paper 2032,72 p.,illus.,tables. Jan.1943. Ref. 1.9605 So38
Minnesota Agricultural Experiment Station and the U. S. Soil Conservation Service, cooperating.
Covers drainage of shallow peat over sand, silt, and clay; deep peat over silt, sand, or clay ; treatment of free water under pressure beneath peat; spacing and depth of tile drains in deep peat; drainage outlets in peat soil; drainage of peat-swamp forest; mapping the drainage system; and tile used in peat soils.

526. ROE, H. B. A study of influence of depth of ground-water level on yields of crops grown on peat lands. Minn. Agr. Expt. Sta. B. 330,32 p.,illus.,tables. Aug.1936. Ref. 100 M66
Determination of the degree of drainage necessary for the production of the best practical results with field and horticultural crops in Minnesota peat.

527. RUSSELL, M. B. Predicting changes in water-table elevation in peat land. Agr Engin. 26:292,illus. July 1945. Ref. 58.8 Ag83
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529. SEVERSON, H. Muck makes millions. Banking 40(2):50-51,119-120. Aug.1947. 284.8 Am3
How drainage has wrested thousands of acres of profitable agricultural land from the swamps of Florida's Everglades.

530. SHAFER, F. F. The problems of controlled drainage for muck and peat lands. Milwaukee,U. S. Soil Conserv. Serv., Upper Miss. Region,1946. 26 p.,illus. Ref. 1.9605 P9422

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531. SKOROPANOV, S. G. Osushenie i sel'skokhoziaistvennoe osvoenie bolot v. Belorusii. Moscow, Gosudarstvennoe Isdatel'stvo Sel'skokhozîaĭstvennoĭ Literatury, 1954. 130 p. 54 Sk5

Drainage and agricultural utilization of peat bogs in Belorussia.

532. STEPHENS, J. C. Drainage of peat and muck lands. U. S. D. A. Ybk. Agr. 1955:539-557. 1 Ag84Y

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533. SUBKOV, A. I. Mechanized drainage and reclamation of peat bogs and swampy lands. (In Russian.) Dostizheniîà Nauk. i Peredovago Opyta v Sel'sk. Khoz. 3:87-88, illus. Mar. 1952. 20 D742

534. SVÂDOVSKY, E. G. Deposition of peat and diminution of the depth of drainage canals in marshlands. (In Russian.) Vsesoîûzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 23/24:56-59. 1939. 20 Ak1

Settling of the peat often causes damage to the drainage canals in bogs. The remedy is to dig deep canals reaching down to the mineral layer of the marsh.

535. THOMPSON, F. B., and ELLIOTT, I. L. The development of peat land. New Zeal. J. Agr. 80:101-108, illus. Feb. 1950. 23 N48J

Results of research in New Zealand indicate that mole drainage may be satisfactory provided there is not too much timber in the peat. The effect of drainage on the permeability of peat soil is discussed.

536. THOMPSON, F. B., ELLIOTT, I. L., and ADAM, J. The development of peat soils. New Zeal. J. Agr. 84:4-5, 7-9, 10. Jan. 15, 1952. 23 N48J

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537. TÎÛLENEV, N. A. Utilization of aeration drainage against dying out of legumes on drained peat soils. (In Russian.) Vsesoîûzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 17(5):24-30. 1952. 20 Ak1

Mole drains increased nitrification and hay yield and ultimately increased the proportion of clover in meadowgrass.

538. VEENENBOS, J. S. Infiltration in peat soils. Internatl. Cong. Soil Sci. 4th Trans. 2:199-203, illus., table. 1950. Ref. 56.09 In844

Concludes that infiltration in drained peat soils is possible on the surface with ditches and trenches, and in the subsoil with mole-track and drain-tube infiltration.

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Soil-water conditions and crop yields on the experimental plots at Maasaja in 1939-44. Finnish research on the effects of open-ditch and underground drainage of peat soils on crop yields.

540. WILDE, S. A., TRACH, J., and PETERSON, S. F. Electrochemical properties of ground water in major types of Wisconsin organic soils. Soil Sci. Soc. Amer. Proc. 14:279-281, illus., tables. 1949. Ref. 56.9 So3

Electro-chemical analysis of ground water should be of value in projects dealing with drainage of organic soils and the artificial regulation of their water tables.

Forests

541. DAY, C. W. R. Swamp drainage. Pulp & Paper Mag. Can-

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588. HENDERSON, J. M. Mosquito-control practice with DDT. Engin. News-Rec. 140:1034-1037,illus.,tables. June 24, 1948. 290.8 En34

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596. LUDWIG, B. H. Dynamite spells doom for insect menace. Explosives Engin. 25:119,illus. July/Aug.1947. Libr. Cong.

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597. MYERS, L. E., JR. The relationship of agricultural drainage to mosquito control. Calif. Mosquito Control Assoc. Proc. & Papers 20:75-76. 1952. 428 C763

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610. THE USE of precast concrete ditch lining for malaria control in Chatham County, Georgia. Amer. City 56(10):42-43,illus. Oct. 1941. 98.58 Am31

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629. CANALINI, G. La bonifica integrale nel sistema del nuovo Codice Civile. Ital. Agr. 78:647-656. Sept.1941. 16 It1
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631. CLARK, M. W. Planning farms for management of runoff water. Agr. Engin. 24:197-198,illus. June 1943. 58.8 Ag83
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1077. HALLGREN, G. De statliga dräneringsförsöken. Svensk Jordbr. Forsk. 1948:17-28,illus. 11 J763
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Covers layout, drawing the moles, linking outlet drains with intermediate mole drains, permanent outlets, renewal of mole drains, depth of drains, the time to drain, and costs.

1080. HAMBLYN, C. J. Trials with shallow, smallbore mole drains. New Zeal. J. Agr. 80:534,illus. June 1950. 23 N48J
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1082. HARDING, S. W., and WOOD, J. K. Model tests of flow into drains. Soil Sci. Soc. Amer. Proc. 6:117-119,illus. 1941. 56.9 So3
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1083. HART, R. A. Profundidad de los drenajes de "la hacienda". Campesino 71:72-76,illus. Feb.1939. 9.3 So12
Soil factors affecting the optimum depth for tile drains in Chile.

1084. HARVEY, N. Relics of a great achievement; some veteran deep-drainage schemes. Land Agents' Soc. J. 54:475-477, Oct.1955. 282.9 L22
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1087. HASWELL, J. R. Some tile drainage experiences. Agr. Engin. 30:81-83,85,illus. Feb.1949. 58.8 Ag83
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1088. HEIMPEL, L. G. Underdrainage. Macdonald Col. J. 4(1): 4-5,11,illus. Sept.1943. 101 M144
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1089. HERRMANN, H. Die durchführung von moormeliorationen. Allgäuer Bauernbl. 17:534-535. Sept.22,1949. 18 AL53

Drainage of marshland in Germany is possible with woodbox drains. Pipes are more expensive.

1090. HEYNDRICKX, G. A. De stroming van het water in drainbuizen en de berekning van hun afvoer. Gent. Landbhogesch. Meded. 19:271-309. June 1954. Ref. 105.1 G344

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1091. HOCK, O. W. Now they are using moles to drain farm lowlands. Better Farming Methods 27(6):28-29,illus. June 1955. 58.8 B46

Mole drainage of heavy muck soils in Florida and heavy clay and gumbo soils in Louisiana and Minnesota.

1092. HOOGHOUDT, S. B. Tile drainage and sub-irrigation. Soil Sci. 74:35-48,illus.,tables. July 1952. Ref. 56.8 So3

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1093. HOPEWELL, H. G. Mole drainage investigations in New Zealand. 2. Report on investigations of some methods of connecting minor mole drains to major mole drains. New Zeal. J. Sci. & Technol. 35A:237-244,illus.,tables. Oct.1953. Ref. 514 N48A

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For Pt. 1 see item 1101.

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1095. HOPEWELL, H. G. Tile drainage investigations in New Zealand. 1. Interim report on investigations into the effect of various methods of refilling tile trenches. New Zeal. J. Sci. & Technol. 35A: 249-261,illus. Oct.1953. Ref. 514 N48A

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1096. HORE, E. R., and KIDDER, E. H. Water table drawdown characteristics. Agr. Engin. 35:396-398,illus.,tables. June 1954. Ref. 58.8 Ag83

A comparative study of four field methods of water-table observation in clay loam soil. An evaluation and discussion of a new depth and spacing formula for lateral tile drains is presented also.

1097. HOWALD, R. Maulwurfs-drainage. Grüne 77:635-643. June 17, 1949. 17 Sch9

Mole drainage in Switzerland.

1098. HUDSON, A. W. Drainage as a factor in increasing production. New Zeal. Grassland Assoc. Proc. 13:139-148,illus. 1951. 60.19 N48

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Covers: History of mole drainage; types, operation and maintenance of mole plows; soils suited to mole drainage; inflow and outflow of water in drains; depth, size, length, and spacing of mole drains; and direction and gradient of drains.

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1103. ILLINOIS. UNIVERSITY. COLLEGE OF AGRICULTURE. EXTENSION SERV. Physical requirements for drain tile. Ill. Agr. Col. Ext. A Eng 605,3 p.,tables. Oct.18,1949. 275.29 IL62Pa

ASTM specifications for draintile (C4-24).

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1104. JACOBSEN, J. Wooden drain pipes. Mon. B. Agr. Sci. & Pract. 27:197. May 1936. 28 In8Mo

A Danish invention expected to be effective in Finland.

1105. JACOBSEN, P. Keep your tile drains working. U. S. D. A. L. 347,8 p.,illus. Jan.1954. 1 Ag84L

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1107. JOFFE, J. S., and KRUEGER, W. C. Surface swamping and its treatment. N. J. Col. Agr. Ext. B. 215,7 p.,illus. Feb.1940. 275.29 N46

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1108. JONES, H. I. Tackling the problem of underground seepage. Soil Conserv. 20:130-131,134,illus. Jan.1955. 1.6 So3S

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Pipe drainage methods in Sweden and Finland. Covers size and depth of pipe.

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Deep drainage trials in Finland. Investigations were concerned with different drainage methods, drain depth, and numbers of drains per area unit.

1112. KAITERA, P. Peltojen salaojituksesta, 1-2. Suomen Maataloustiet. Seura. Maataloustiet. Aikakausk. 23:1-31; 24:79-84,illus., tables. 1951-1952. Ref. 20 Su7M

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Covers history, costs, and benefits of tile drainage, and discusses the drainage of peat soils, types of outlets, location, size, type, depth and spacing of tile drains, and tile trenching machines.

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1119. KIRKHAM, D., and SCHWAB, G. O. The effect of circular perforations on flow into subsurface drain tubes. 1.-2. Agr. Engin. 32: 211-214,270-274,illus. Apr.-May 1951. Ref. 58.8 Ag83

Pt., 1, Theory; Pt. 2, Experiments and results.

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The order of the authors' names is reversed in Pt. 2.

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1122. KIRKHAM, D. Pressure and streamline distribution in water-logged land overlying an impervious layer. Soil Sci. Soc. Amer. Proc. 5:64-68,illus. 1940. 56.9 So3

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1123. KRIVONOSOV, I. M. Drainage of swampy mineral soils with draining tiles combined with mole drains. (In Russian.) Gidrotekh. i Melior. 6(4):15-23. Apr.1954. 290.8 G362

1124. KUPPER. Entwässerung mit dem maulwurpflug. Landwirt. Z. der Nord-Rheinprov. 119:850-851,illus. Aug.9,1952. 18 L2344

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1125. KUUM, IU. Method of constructing closed drainage in Estonian SSR with the aid of a trench digger. (In Russian.) Gidrotekh. i Melior. 6(12):54-55. Dec.1954. 290.8 G362

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1130. LEVITT, E. C. Irrigation and drainage in coastal citrus orchards. Agr. Gaz. N. S. Wales 58 (1):21-22. Jan.1,1947. 23 N472

Tile pipes are recommended for underdrainage. Interception and "spot" drains are explained, and spacing and depth of tile are discussed.

1131. LUEBCKE, H. N. Special drainage along Ohio Turnpike to protect farm tilling. Roads & St. 96(7):73-76,79-81,illus. July 1953. 288.8 R536

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1132. LYNES, W. S. Concrete bulkheads for outlet protection. Agr. Engin. 27:459-460,illus. Oct.1946. 58.8 Ag83

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1133. MCCLURG, V. O. Heavy-duty clay tile drains. Engin. News-Rec. 131:263,illus. Aug.12,1943. 290.8 En34

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1134. MCCULLOCH, R. Bog reclamation in Galway. Agr. Ireland 9:225-227. Oct.1952. 10.5 Ag8

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1135. MCCULLOCH, R. Mole draining. Irish Agr. & Creamery Rev. 14(138, n. s.):13-15. June 1945. 44.8 C866

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1137. MALYGIN, V. S. A deep closed drainage system. (In Russian.) Tashkent,Soiuznikhi,1939. 122 p.,illus.,tables. 54 M29

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1138. MANSON, P. W., and MILLER, D. B. Essential characteristics of durable concrete draintile for alkali soils. Agr. Engin. 29: 485-487,489,illus.,tables. Nov.1948. 58.8 Ag83

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1139. MANSON, P. W. Importance of drain tile testing. Minn. Farm & Home Sci. 12(20):14,17,illus. Feb.1955. 100 M668

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1141. MANSON, P. W., and MILLER, D. G. Practical aspects of draintile durability. Agr. Engin. 35:717-718,725,illus.,tables. Oct. 1954. Ref. 58.8 Ag83

Recommendations for tiles subject to freezing, alkali, or acid conditions.

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1144. MAYO, K. L. Installation of effective mole drainage. New Zeal. J. Agr. 90:395-399,illus. Apr.15,1955. 23 N48J

On clay soils in New Zealand. Mole plows, depth and distance apart of mole drains, life of drains, effects of drainage, and costs, are discussed.

1145. MILLER, D. G., and MANSON, P. W. Durability of concretes and mortars in acid soils with particular reference to drain tile. Minn. Agr. Expt. Sta. Tech. B. 180,80 p.,illus.,tables. June 1948. Ref. 100 M66

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1147. MILLER, D. G., and SNYDER, C. G. Expansion of clay and concrete drain tile due to increase of temperature and moisture

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Cement curing in draintile manufacture.

1149. MILLER, D. G., and MANSON, P. W. Longtime performance of some clay draintile. Agr. Engin. 32:95-97,100-101,tables. Feb.1951. 58.8 Ag83
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1153. MOLE drainage procedure. Agr. Mach. J. 8(3):46,54. Mar. 1954. 58.8 Ag86
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1155. MUIRHEID, B. F. Buying good drain tile. Ill. Agr. Ext. C. 696,6 p.,illus.,table. July 1952. 275.29 I162C
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1158. NICHOLSON, H. H. Field drainage; its fundamental importance. Times Trade & Engin. (n.s.) 48(924):28. Feb.1941. 286.8 T482
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1159. NICHOLSON, H. H. Field drainage problems. 1-8. Estate Mag. 43:211-212;237-238;258-259;289-290;318-320; 44:12-14;41-43; 69-70. Aug.1943-Mar.1944. 10 Es8
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1161. NICHOLSON, H. H. Mole drainage for heavy land. Gt. Brit.

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1162. NICHOLSON, H. H. Some problems in field drainage. Scot. J. Agr. 25:213-219. Jan.1946. 10 Sco82So
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1164. OLSEN, J. T. Orchard drainage. Fruit Grower 58:10,19, 23,illus. Apr.1938. 80 G85
Discusses tile drainage, surface inlets, and the problem of roots clogging drains. Includes testing for drainage by soil borings.

1165. OVERHOLT, V. Farm drainage. Farm Q. 2(1):40-45,103-104,illus.,tables. Spring 1947. 6 F22995
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1166. PEARCE, O. W. M. Nitrogen and drainage. So. African Sugar Technol. Assoc. Proc. 24:77-82. 1950. 65.9 So83
Includes discussion.
French drains remove the minimum of plant nutrients from the soil. Their construction is described and their merits compared with those of shallow open drains.
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1167. PEARSON, C. H. O. Mole drains and their uses; their practicability in the Sugar Belt. So. African Sugar J. 35:625,627,629, illus. Oct.1951. 65.8 So8
Mole drains are preferred to open ditches for draining valley bottoms and clay lands. Layout, equipment, and depth of the drains are discussed.

1168. PIJLS, F. W. G. Drainage in de tuinbouw. Netherlands. Dir. van de Tuinbouw. Meded. 12:709-716. Aug./Sept.1949. 86 N384
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1169. PIPE drains stop an earth slide. Engin. News-Rec. 128: 539-540,illus. Apr.9,1942. 290.8 En34
Drainage of an earth slide near San Francisco by putting down vertical holes from which perforated drainpipes allow escape for ground water.

1170. POWERS, W. L. The durability of concrete drain pipe. Agr. Engin. 29:77. Feb.1948. 58.8 Ag83
The effect of alfalfa roots and of acid soil on concrete.

1171. RAMSAUER, B. Die Maulwurfdränung. Bodenkultur 6: 170-195,illus.,tables. 1952. Ref. 19 B635
Mole drainage in Austria. Technique, machinery, and layout in relation to soil type are discussed.

1172. RECORD well-point installation used to drain exposition site. West. Constr. News 13(6):209-212,illus. June 1938. 290.8 W522
The salt-water level over 300 acres was lowered by drainage preliminary to landscaping the site of the Golden Gate International Exposition.

1173. RESHETKINA, N. Vertical drainage of saline lands of Uzbekistan. (In Russian.) Khlopkovodstvo 5(5):47-50. May 1955. 72.8 K522

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1180. SCHILDKNECHT, H. Reclamation in Switzerland. Reclam. Era 34:65-66,76,illus. Apr.1948. 156.84 R24
Tile drainage of swamps for food production during the war.

1181. SCHMITT, E. A., and MACQUEEN, P. O. Perforated-pipe underdrains for rapid sand filters. Amer. Waterworks Assoc. J. 34: 857-876,tables. June 1942. 292.9 Am32J
Discussion by E. A. Hardin, p. 875-876.

1182. SCHROEDER, G. Die dränung. In his Landwirtschaftliche wasserbau, p. 186-234,illus.,tables. Berlin,Springer,1937. 290 Sch72
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1183. SCHWAB, G. O. Plastic tubing for subsurface drainage. Agr. Engin. 36:86-89,92,illus. Feb.1955. Ref. 58.8 Ag83
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1184. SCHWAB, G. O. Subsurface drainage with small perforated flexible tubes in mole drains. Iowa State Col. J. Sci. 26:285-286. Jan.1952. 470 Io9
Abstract of thesis (Ph.D.) — Iowa State College, 1951.
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1185. SEARLE, K. D., and STEWART, D. Land reclamation on the shores of the Great Salt Lake. Land Impr. 2(7):16-17,illus. July 1955. 282.8 L224

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1186. SEIDEMANN, J. Planung und erhaltung der kulturtechnischen anlagen in den landwirtschaftlichen produktionsgenossenschaften. Deut. Akad. Landwirtwiss. Schrreihe. f. die Landwirt. Produkgenossensch. 10,18 p.,illus. 1953. 18 D4825S

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1187. SHAFER, F. F. Causes of failure in tile drains. Agr. Engin. 21:17-18,20. Jan.1940. 58.8 Ag83

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1188. SHAFER, G. E., and KROFF, W. J. Probable life of corrugated culverts. Engin. News-Rec. 135:504-506,illus. Oct.18,1945. 290.8 En34

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1189. SHOJI, H., and MORISHIMA, S. On the past and present under-drain at Kyushu. (In Japanese.) Nogyodoboku-Kenkyu 16:2-9, illus. Oct.1948. Ref. 290.8 N68

1190. SISSON, D. R. Tiling for 30,000. Land Impr. 2(11):15,35, illus. Nov.1955. 282.8 L224

The Indiana Drainage Contractors Association demonstrates equipment and methods for draining seventeen acres of poorly drained clay farmland.

1191. SLATER, C. S. The depth and spacing of tile drains. Agr. Engin. 31:448-450,illus. Sept.1950. Ref. 58.8 Ag83

A formula is derived for the calculation of drain spacing.

1192. SPANGLER, M. G. The structural design of flexible pipe culverts. Iowa Engin. Expt. Sta. B. 153,84 p.,illus.,tables. Dec.1941. Ref. 290.9 Io9

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1193. STEIN, C. Die beherrschung des wasserhaushalts im boden durch eine kombinierte untergrund-ent-und -bewässerungsanlage. Deut. Landwirt. 2:259-263. May 1951. 18 D4822

Discusses depth of pipe drains in respect to future maintenance. Bitumen pipes are preferred because they can be nearer the surface of the soil.

1194. STEIN, C. Nene gesichtspunkte bei der landwirtschaftlichen ent- und bewässerung. Wasser u. Boden 2:209-212,illus. Oct.1950. 56.8 W28

New viewpoint on agricultural drainage and irrigation in Germany. Describes method for connecting pipe with asphalt.

1195. STRINGER, N. E. Mole ploughing as applied to irrigated swamp areas. So. Austral. Dept. Agr. J. 45:283-286,illus. Dec.1941. 23 So84

Mole drains may be used in swamp areas provided the soil is plastic enough to hold the drain. Depth and spacing of the moles varies according to the type and condition of the soil. Benefits and costs are discussed.

1196. SUBDRAINAGE with Toncan drainage products. Cleveland, Toncan Culvert Mfg. Assoc.,1939. 31 p. 54 T61

Requirements of pipes for farm drainage included.

1197. SUTTON, J. G. How to plan a tile drainage system. Washington,U. S. Soil Conserv. Serv.,1942. 11 p.,illus. 1.96 Op2Ho

Address prepared for the American Society of Agricultural Engineers, Southwest Section, Shreveport, La., Apr. 3, 1942.

Covers location of tile lines, capacity of tile drains, depth and spac-

ing of tiles, computation of flow in drains, surface inlets, outlet protection, and tile drains on irrigated lands.

1198. SUTTON, J. G. How to plan a tile drainage system. Washington,U. S. Soil Conserv. Serv.,1948. 17 p.,illus.,tables. 1.96 Op2Ho

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1199. SUTTON, J. G. Tile drainage. Washington,U. S. Soil Conserv. Serv.,1954. 9 p. Ref. 1.96 OP2Sut

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1200. TAMAYO, J. L. Algunas ideas sobre la conservacion de obras de riego. Irrig. Mex. 22:155-175,427-465,illus.,tables. Mar./Apr., Nov./Dec.1941. 55.8 Ir76

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1201. TATARINOVA, N. K. Mole drainage on meadows of excessively mineral soils in the non-Black soil area. (In Russian.) Sotsialist. Zhivotnovod. 12(6):15-19,illus.,tables. June 1950. 49 So71

1202. TRUSS, P. Effect of mole drainage and subsoil plowing on water-salt process in soils, and yields under conditions of Baraba. (In Russian.) Pochvovedenie 4:62-68. Apr.1955. Ref. 57.8 P34

Cereals.

1203. U. S. SOIL CONSERVATION SERV. Laying tile by hand. U. S. Soil Conserv. Serv. J. S.-40,2 p.,illus. June 1953. 1.9605 J11

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1204. VALENTIN, J. Assainissement des terres dans la région de l'ouest. Potasse 20:153-154,illus. May 1946. 57.8 P84

Land drainage in the west of France. Primarily tile drainage.

1205. VAN BAVEL, C. H. M. Will this soil drain? Crops & Soils 2(7):10-11,illus. Apr./May 1950. 6 W55

Determing soil permeability for spacing of draintiles.

1206. VAN SCHILFGAARDE, J. Analytical and empirical evaluation of water table behavior as affected by drainage systems. (Abs.) Iowa State Col. J. Sci. 29:524-525. Feb.15,1955. 470 Io9

Abstract of Thesis (Ph.D) — Iowa State College, 1954.

A field laboratory investigation of the effect of the depth and spacing of tile drains on the rate of drawdown of the water table.

1207. VAN SCHILFGAARDE, J., FREVERT, R. K., and SCHLICK, W. J. Effect of present installation practices on draintile loading. Agr. Engin. 32:371-374,378,illus.,tables. July 1951. 58.8 Ag83

Most of the tile installed with modern equipment is at moderate depths not subject to excessive loading.

Comment on this article by R. Chen in Agr. Engin. 32:600. Nov.1951. 58.8 Ag83

1208. VAN SCHILFGAARDE, J., FREVERT, R. K., and KIRKHAM, D. A tile drainage field laboratory. Agr. Engin. 35:474-478,illus. July 1954. Ref. 58.8 Ag83

Discusses an attempt to find an empirical criterion for the appropriate selection of the depth and spacing at which tile lines should be placed in different soils. Methods and equipment used in the study are described.

1209. VAN VLACK, C. H., and NORTON, R. A. Tile drainage for increased production. Iowa. Agr. Expt. Sta. B. P65,31 p.,illus. June 1944. 100 Io9

Practical details of all aspects of tile drainage including notes on management practices which improve drainage conditions. Sketches and illustrated descriptions of layouts, operations, implements, outlets, and a surface inlet are given.

1210. VILLENEUVE, G. O. L'utilité du drain. Forêt Québecoise 14:231-232. Apr.1949. 99.8 F79

Necessity of tile drains to lower a high water table. Some directions for selecting and laying tile are given. Recommends grading to a slope for the tile system.

1211. VISSER, W. C. Tile drainage in the Netherlands. Netherlands.J. Agr. Sci. 2:69-87,illus.,tables. May 1954. 12 N3892

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1212. VOGELZANG, H. Ontwatering van grasland. Nederland. Heidemaatsch. Tijdschr. 62:290-293,illus. Nov.1951. 12 N282

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1213. WAGNER, V. J. Drainage problems — how to tackle. Queensland Fruit & Veg. News 5:390-391. Apr.1,1954. 280.38 Q3

Cost of mole and tile drainage in Australia.

1214. WALKER, C. Management of poaching soils. New Zeal. J. Agr. 78:365-367,illus. Apr.1949. 23 N48J

Drainage of muddy soils in New Zealand. Underground drainage, tile or mole, is recommended.

1215. WEBB, C. T., and HICKMAN, W. D. Tile solves problem in Palouse. Soil Conserv. 19:283-285,illus. July 1954. 1.6 So3S

Tile drainage of hard clay soils in Washington and Idaho.

1216. WESSELING, J., and WIJK, W. R. VAN. Optimal depth of drainage. Netherlands J. Agr. Sci. 3:106-118,illus. May 1955. Ref. 12 N3892

A technical discussion of tile drainage depth in clay and sand soils for maximum crop production in the Netherlands.

1217. WESSELING, J. Tile drainage research. Netherlands J. Agr. Sci. 2:254-259,table. Nov.1954. Ref. 12 N3892

A résumé of tile-drainage research covering spacing, depth, effect on soil temperature and moisture evaporation, and agricultural effects of drainage.

1218. WIANCKO, A. T., WALKER, G. P., and ROBBINS, C. The tile drainage experiment. Ind. Agr. Expt. Sta. C. 244:5-6,tables. May 1939. 100 In2P

An experiment designed to determine the value of tile drainage, and the most practical size, depth, and spacing,of tiles in this Indiana soil.

1219. WIKLANDER, L. Om järnutfällning i täckdikesledninger. Lantbr. Akad. Tidskr. 84:358-367,tables. 1945. Ref. 104 Su3

German summary.

Oxidation of divalent iron and subsequent precipitation in drainpipes may seriously disturb the operation of drainage installations. The harmful effects of iron bacteria can be minimized by sloping the conduits at a steep angle, by putting the mouth of the drain below the water table, or by using copper nets in the pipes or copper casings at the pipe joints, thereby poisoning the iron bacteria.

1220. WOODWARD, G. O., and MILLER, W. MCN. A study of soil-water movement by electroosmosis. Agr. Engin. 34:29-33. Jan. 1953. Ref. 58.8 Ag83

"This paper was prepared for the purpose of assimilating the major-

ity of published references dealing with the electrical treatment of soils. It is intended as general information for persons who may become associated with what appears to be a developing interest in the possibility of electrical drainage of agricultural lands," p. 29.

1221. ZWERMAN, P. J. Problems of drainage in a soil and water conservation program. J. Soil & Water Conserv. 6:185-186,199,illus. Oct.1951. 56.8 J822

The most intensively drained areas in the United States are discussed in general, with particular attention to Tiffin, Ohio. Details of a tile drainage system are given, including depth and spacing of tiles, and the effect of poor drainage on crops.

Pump Drainage and Wells

1222. AUGMENTED Fen drainage scheme. Oil Engine & Gas Turbine 18:88-90,illus. July 1950. Libr. Cong.

Gwynne flow pumps in England.

1223. BANKS, H. O., and RICHTER, R. C. Sea-water intrusion into ground-water basins bordering the California coast and inland bays. Amer. Geophys. Union Trans. 34:575-582,map. Aug.1953. Ref. 330.9 Am3

The erection of dikes and pumping stations is among the solutions offered for the salinifacation of ground water in California.

1224. BARRON, R. A. Consolidation of fine-grained soils by drain wells. Amer. Soc. Civ. Engin. Proc. 73:811-835,illus. June 1947. 290.9 Am3P

Complete formulas for consolidation by vertical and radical flow to wells, for cases with or without peripheral smear and drain-well resistance, are presented.

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1225. BELL, R. A new approach to drainage. Ga. "Ag. Engin." 24:15,28-30. 1953. 290.9 G29

Drainage of low-lying lands in Georgia by means of dug wells 200 feet deep.

1226. BISAL, F. Siphon drainage in the Hyde-Park-Benson area, Cache Valley, Utah. Soil Sci. 67:395-401,illus. May 1949. 56.8 So3

Proposed siphon-connected well-drain system for relieving hydrostatic pressure of an artesian aquifer.

1227. BOONENBURG, K. De windmolens van Nederland. Tijdschr. v. Econ. Geog. 37:300-307,illus.,tables. Oct.15,1946. 280.8 T44

Windmills on the Netherlands polders.

1228. BUSQUET, J. C. Large pumps for drainage and irrigation. Way Ahead 5:24-29,illus. 1955. 280.8 W362

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1229. BUTLER, C. Problems of a present day homesteader. Natl. Reclam. Assoc. Proc. 18:72-76. 1949. 55.9 N212

Includes drainage by sump wells drilled through lava rock until a crack is found that will carry off the waste water.

1230. CAMPBELL, R. D. Eldred Drainage and Levee District installs two more diesels. Diesel Power 18:855-858. Oct.1940. 291.8 D562

Eldred, Ill. Drainage pumps.

1231. CAMPBELL, R. D. Keach Drainage and Levee District. Diesel Prog. 6(12):34-35,48-50. Dec.1940. 291.8 D56

Drainage pumping plant in Illinois.

1232. CLARK, R. G. St. Germans sluice and pumping station. Inst. Civ. Engin. J. 6:377-392. Apr.1936. 290.9 In74J

Revamping old drainage works in Cambridgeshire in England's Fens, and the construction of sluiceways and three new pumping units.

1233. CLASSEN, A. G. Practical aspects of flood control and reclamation of overflowed lands. Tex. Reclam. Dept. B. 27,80 p.,illus. Dec.1935. Ref. 54.9 T31

Includes drainage, sluice gates, and pumping plants.

1234. CLAY, C. Pumping stations, with special reference to land drainage and storm-water disposal. Inst. Civ. Engin. J. 5:35-58,illus. Mar.1945. 290.9 In74J

Describes functions and operations, with costs, of axial-flow and centrifugal drainage pumps in use for land drainage in England by the Catchment Board of the Ministry of Agriculture. Also gives a brief history of agricultural drainage in England, and outlines the benefit to agriculture of planned drainage.

1235. COFFEY, J. H. Vertical pump applications. Amer. Water Works Assoc. J. 31:1684-1690,illus. Oct.1939. 299.9 Am32J

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1236. CRAWFORD, A. Development of derelict land. New Zeal. Farmer 71(6):3-4,illus. May 11, 1950. 23 N484

In New Zealand, drainage water from developed land is pumped by a gasoline-powered pump to irrigate dry land.

1237. DIESEL-pump team cuts drainage cost. Diesel Power 29(2):42-43. Feb.1951. 291.8 D562

Diesel drainage pump on farmlands in the South River Drainage District, Missouri. Includes cost.

1238. DIESELS help hold back the river. Diesel Power & Diesel Transportation 17:964-965,illus. Dec.1939. 291.8 D562

Diesel-driven pumps of the Henderson County, Ill., Drainage Districts Nos. 1 and 2 maintain the water level of the district's rich bottom lands to prevent the highly cultivated fields from reverting to swamps.

1239. DRAINAGE in East Anglia. Elect. Rev. 121:400,illus. Sept.24,1937. 335.8 E122

Wind pumps have been supplanted by electric pumps in the drainage of England's Fens.

1240. DRAINING the Fens; gradual change-over to electric pumping. Elect. Rev. 148:421-425,illus.,map. Mar.2,1951. 335.8 E122

Description of the pumps used to drain the 240 square miles covered by the South Holland Drainage Boards, England.

1241. ESTATE power supplied by many engines. Oil Engine & Gas Turbine 19:266-268,illus. Nov.1951. Libr. Cong.

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1242. EVANS, C. B., and ALLISON, R. V. The soils of the Everglades in relation to reclamation and conservation operations. Soil Sci. Soc. Fla. Proc. 4A:34-46,illus.,maps,tables. 1942. 56.9 So32

It is recommended that a unit plan of development be adopted with principal reliance placed upon pumping units rather than gravity drainage in order to provide greater flexibility in water control.

1243. FEN ENGINE experiences. Oil Engine & Gas Turbine 15:24-25. May 1947. Libr. Cong.

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1244. FILMAN, C. C., TRUSCOTT, J. H. L., and GOODWIN-WILSON, R. A. 5,000 acre water garden? Better Crops 32:15-18,46,illus., tables. Apr.1948. 6 B46

Drainage of marshes in Canada by means of pumps. Includes an analysis of drainage water.

1245. FULLERTON, W. H. Recovery of Louisiana bayou farm-

land. Diesel Prog. 13(10):40-41,illus. Oct.1947. 291.8 D56
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1247. GARDNER, W., and PETERSON, A. H. Well battery design. Agr. Engin. 17:293-295,illus. July 1936. 58.8 Ag83
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1248. GOTTLIEB, W. H. Diesel-pump team cuts drainage costs. Pub. Works 80(11):34,36,illus. Nov.1949. 290.8 M922
Diesel-engined drainage pumps in use in the South River Drainage District, Missouri.

1249. GOTTLIEB, W. H. Farming a lake thanks to diesel-pump team. Diesel Prog. 16:51. Jan.1950. 291.8 D56
Pump drainage in Illinois.

1250. GOTTLIEB, W. H. Keeping Corpus dry. Diesel Prog. 17(8):48-50,illus. Aug.1951. 291.8 D56
Diesel pumping plants handle drainage in Corpus Christi, Tex., when tides block the normal outflow and when rainfall is too heavy for normal gravity flow.

1251. GREENE, M. T. Men against the sea in Holland. Contemp. Rev. 183:278-283. May 1953. Libr. Cong.
Construction of the Netherlands polders by diking and pumping, and finally by the digging of drainage ditches. Describes the electrically-driven pumps capable of removing 250,000 gallons a minute, and the diesel-operated pumps which lift 120,000 gallons a minute. Tractor-driven plows that dig drainage ditches ten feet deep are also discussed.

1252. HARRISON, G. R. Small muck drainage outfit. Elect. Farm 22(5):20-21. May 1949. 335.8 EL27
A 2-hp. electric pump lifts water from a lateral ditch in the muck area of Indiana up over the bank into the main canal.

1253. HELLINGA, F. Water control. Soil Sci. 74:21-33,illus. July 1952. 56.8 So3
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1254. HIDVEGHY, L. A belviz-atemelotelepek altal szallitott vizmennyisegek folyamatos merese. Vizügyi Közlem. 30:470-480,illus. 1948. 290.9 H89
English summary, p. 103-104.
Recording the discharge of drainage pumps.
Hungary.

1255. HOOPER, W. T. Cornish pumping engines. Engineer 197(Supp.):22-23,illus. June 11, 1954. Libr. Cong.
Illustrated description of pumping engines used in Cornwall, and based on a plan invented for the draining of Haarlem Mere in Holland in 1924.

1256. IHRIG, D. A belvizatemelo telepek vizhozamanak merese. Vizügyi Közlem. 30:436-444. 1948. 290.9 H89
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1258. ISRAELSEN, O. W. Pumping ground water has twin benefits; well system on California, Arizona patterns might solve both irrigation and drainage problems in parts of Intermountain Region. Utah. Farm & Home Sci. 8(3):1,8-9,11,illus. Sept.1947. 100 Ut1F

1259. JONES, W. R. Easy-to-install drain wells placed behind leaking levee. Engin. News-Rec. 146(20):37,illus. May 17, 1951. 290.8 En34

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1260. KLINGNER, W. H., and CARROLL, M. B. JR. Diesel-driven pumps reduce Drainage District costs. Pub. Works 84(11):70,illus. Nov.1953. 290.8 M922

Pumping costs are cut 34 percent in Illinois' Indian Grave Drainage District.

1261. KUVAS, K. Fra Dansk marskland. Landbrukstidende 57: 784-787,illus. Oct.31,1951. 11 L236

Drainage of marshlands by canals and pumping in Denmark.

1262. LAFFERTY, O. W. A pump installation to drain a 300-acre salt marsh. Mosquito News 5:146-147,illus. Dec.1945. 421 M85

Mosquito control by drainage and pumping in Cape May County, N. J.

1263. LARSON, C. L. Your drainage system needs a good outlet! Minn. Farm & Home Sci. 9(2):13. Feb.1952. 100 M666

Electric pumping outlets for tile-drainage systems.

1264. LIERE, W. J. VAN. A soil survey of the Adana Delta (Turkey). Internatl. Cong. Soil Sci. 4th. Trans. 2:187-190,map. 1950. 56.09 In844

Drainage by pumping would increase yields of sugarcane.

1265. LUND, B. Tørrlegging av jord ved dambygging og pumpeverk. Norsk Landbr. 16:418-419,illus. Nov.10,1950. 11 N8122

Drainage of land by damming and pumping. Farmland in Norway.

1266. MCGEORGE, W. G. Drainage pump. Water & Sewage 78(2):17-18,49,illus. Feb.1940. 290.8 C16B

A drainage pump installed in Kent County, Ontario, where the elevation of the land, as compared to the lake level, makes drainage by gravity impossible.

1267. MARVIN, V. Electric power as a tool in farm drainage. Agr. Engin. 29:430,illus. Oct.1948. 58.8 Ag83

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1268. MARVIN, V. When tile is not enough—use a pump. Elect. Farm 24(2):5-7,illus. Feb.1951. 335.8 EL27

Electric pump for draining wet spots in meadows where gravity will not cooperate. Includes costs of installation of the pump, motor, and pumphouse, and annual operating costs.

1269. MILLIGAN, C. H. Pumping ground water for irrigation and drainage. Amer. Soc. Civ. Engin. Proc. Separate 618,7 p. Feb. 1955. 290.9 Am3Ps

1270. MIRAMONTES, F. C. Pump testing service. West. Farm Equip. 51:27-28,30,illus. Jan.1954. 58.8 Im73

Includes underground water in the West.

1271. MONHEMIUS, L. Het schepradgemaal van Rynland to Spaarndam. Ingenieur 52(36):91-94. Sept.3,1937. Libr. Cong.

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1272. MONSON, O. W., and MURDOCK, H. E. The homemade centrifugal pump. Mont. Agr. Expt. Sta. C. 150,20 p.,illus.,tables. Apr.1937. 100 M76

1273. MONSON, O. W., and MURDOCK, H. E. A homemade centrifugal pump and other water-lifting devices. Mont. Agr. Expt. Sta. B. 324,51 p.,illus.,tables. Aug.1936. 100 M76

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DRAINAGE NEEDS AND EFFECTS

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On claypan soils with slight slope the upper terrace channel must be drained during periods of excessive rainfall to prevent damage to wheat.

1499. HARRISON, R. W., and ANDERSON, J. R. Drainage can play big role in future land development. Agr. Situation [Washington] 37(7):5-7,map,tables. July 1953. 1 Ec7Ag

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1501. HOGLUND, C. R. Investments in drainage pay off. Sugar Beet J. 20(9):1,4,illus. June 1955. 66.8 Su38

Crop yields on 40 farms in Michigan were increased 50 to 75 percent as a result of tile drainage. Includes costs.

1502. JOFFE, J. S. Keep your soil well drained. N. J. Ten-Ton Tomato Club. Rptg. 1946:25-27,illus. 81 T253

The importance of good drainage in tomato culture.

1503. JOHNSON, E. A. G. Land drainage in England and Wales. Inst. Civ. Engin. Proc. 3:601-651,illus.,maps. Dec.1954. Ref. 290.9 In74P

Discussion, p. 629-651.

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1504. JONES, L. A. Drainage as a tool for increased crop production. Washington,U. S. Soil Conserv. Serv.,1952. 8 p. 1.96 R31Dra

Paper presented at the American Society of Agricultural Engineers' Soil and Water Program, Centennial of Engineering, Chicago, Sept.9, 1952.

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Also in Agr. Engin. 34:239-242,250. Apr.1953. 58.8 Ag83

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1506. JONES, L. A. Interrelation of drainage and soil conservation practice. (Abs.) Assoc. South. Agr. Workers Proc. 43:32-33. 1942. 4 C82
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1507. JONES, L. A. What drainage has accomplished. Washington,U. S. Bur. Agr. Engin.,1938? 3 p. 1.9 En35Wh
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1508. JUUSELA, T. Täckdikningens inverkan pa jordens vattenhalt, tjälbildning och temperatur. Prakt. Försöksverks. 5:47-48. May/June 1948. 20 P88
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1509. KAITERA, P. Om uppskattning av markytans sättning vid torrläggningsarbetena. Nord. Jordbrforsk. 36:532-537,illus. 1954. Ref. 11 N752
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1510. KEEN, B. A. Land drainage: the area of benefit. Gt. Brit. Min. Agr. Agriculture 43:521-526. Sept.1936. 10 G79J
Effects of flood, and need for drainage on the higher unflooded surrounding land.

1511. KEILHOLZ, F. J. Drainage needs a doctor. Country Gent. 115(5):18,42-43,illus. May 1945. 6 C833
"Approximately 50,000,000 acres — enough to make a 49th State — can be brought into more profitable use with the weapons we have at hand," p. 18.

1512. KENNEY, F. R., and MCATEE, W. L. The problem: Drained areas and wildlife habitats. U. S. D. A. Ybk. Agr. 1938:77-83, illus. 1 Ag84Y
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1513. KLESTRUP-HANSEN, F. Draening og hvorfor. Dansk Landbr. 69:242-243, May 4, 1950. 280.28 V91
Drainage, and why. Its effect on crops in Denmark.

1514. KOHLER, K. O., and MUNCEY, J. A. The water-facilities program. Soil Conserv. 5(7):175-178,195,illus. Jan.1940. 1.6 So3S
Two Texas farms and an Idaho community benefit from improved water facilities, including drainage.

1515. LIERE, W. J. VAN. De afwatering en de drainage in het Westland. Tuinbouw 2:39-41. Feb.1947. 80 T815
Discusses the effect of drainage on crops in market gardens in the Netherlands.

1516. LOURDIN, L. Économie du drainage. Chambres d'Agr. (Tech.-Agr.) 25(49):9-13. Apr.1,1954. 14 T69

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1517. MCCRORY, S. H. Water and the land. Reclam. Era 28:184-186,illus. Sept.1938. 156.84 R24

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1518. MANSON, P. W. Drainage requirements of crops. Minn. Agr. Engin. News Let. 102,1 p.,table. Sept.15,1940. 275.29 M66 Ag

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1520. MANSON, P. W., and ROST, C. O. Farm drainage can increase the size of your farm. Minn. Farm & Home Sci. 8:12-13,illus. Oct.1950. 100 M668

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1522. MARTIN, H. B. A blotter for the Pelican State. Soil Conserv. 13:212-214,illus. May 1948. 1.6 So3S

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1523. MEASURES needed to manage watersheds. J. Soil & Water Conserv. 10:237-240,illus. Sept.1955. 56.8 J822

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1524. MILLER, D. G. Effect of drainage on water levels of farm wells. Minn. Agr. Engin. News Let. 87,1 p.,tables. June 15, 1939. 275.29 M66Ag

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1526. MOTOOKA, T. Some economic characteristics and problems of land reclamation by drainage. (In Japanese.) Nogyo Keizai Kenkyu 27:6-19. Mar.1955. 281.8 N68

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1527. NICHOL, G. E. Tile drainage is profitable. Sugar Beet J. 19(10):1,3,illus. July 1954. 66.8 Su38

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1528. NICHOLSON, H. H. The control of ground water level in crop production. Internatl. Hort. Cong. 13th. Rpt. 2:904-912,illus. 1952. 90.09 C7613

The drained lands of England's Fens.

1529. NICHOLSON, H. H. Field drainage and increased production. Roy. Agr. Soc. Eng. J. 109:212-221,tables. 1948. 10 R81

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1530. NICHOLSON, H. H. Some aspects of field drainage. Agr. Prog. 20:65-69. 1945. 10 Ag86

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1531. NITSENKO, A. A. Observations on changes in the vegetative cover effected by drainage [of marshes]. (In Russian.) Bot. Zhur. 36:349-355. July/Aug.1951. Ref. 451 R923

1532. O'BRIEN, H. R. Surface drainage can double yields; when tile failed to drain their flat land effectively, farmers on hardpan in Ashtabula County, Ohio, perfected an old drainage method with surprising results. Country Gent. 120(11):26-27,71-72,illus. Nov.1950. 6 C833

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1534. OLNEY, A. J., LOWRY, S. J., and CALDWELL, L. M. Effect of cover crops and tile drainage on growth and yield of peaches. Ky. Agr. Expt. Sta. B. 547,8 p.,tables. May 1950. 100 K41

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1535. PALMER, L. Less water, more corn. Soil Conserv. 14: 267-268,279,illus. July 1949. 1.6 So3S

Drainage in Iowa for increased corn yields.

1536. PARKER, E. R., and ROUNDS, M. B. Avocado tree decline in relation to soil moisture and drainage in certain California soils. Amer. Soc. Hort. Sci. Proc. 44:71-79,illus. 1944. Ref. 81 So12

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The drainage program of southern Florida has upset the delicate balance between salt water and fresh water by lowering the water table to sea level. Unless water levels are restored to proper heights irreparable damage will be done to the soil by salt.

1538. PIJLS, F. W. G. Irrigation investigations in Dutch fruit growing. Internatl. Hort. Cong. 13th Rpt. 2:925-934,illus. 1952. Ref. 90.09 C7613

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1539. PILLSBURY, A. F., and HUBERTY, M. R. Drainage of avocado orchards. Calavo News 18(3):5,8-11,illus. Oct./Dec.1944. 280.28 C12

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Thesis (Ph.D.) — Cornell University, 1955.
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Irrigation and drainage in Austria. Importance of reclamation in land and political economy.

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1544. RUSSELL, M. B., and FIRKINS, B. J. Few farms well drained. Farm Sci. Rptr. 5(3):10-11,illus.,table. July 1944. 275.28 F22
Effect of poor drainage on corn crop losses in Iowa.

1545. SALOHEIMO, L. Den lampliga tegbredden pa myrmark. Forsk. - och Försöksresultat 2:59-62,tables. Dec.15,1950. 20 F77
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1546. SALTER, R. M. The engineer's job in developing America's capacity to produce. Agr. Engin. 34:83-87,illus. Feb.1953. 58.8 Ag83
Address before the special meeting of the American Society of Agricultural Engineers, Chicago, Sept. 1952.
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1547. SALTER, R. M. Wildlife and our soil conservation objectives. No. Amer. Wildlife Conf. Trans. 18:81-93. 1953. 412.9 N814
Discussion, p. 91-93.
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1548. SAVESON, I. L. Drainage research for sugarcane land in southern Louisiana. Sugar J. 10(7):7-8,15,illus. Dec.1947. 65.8 Su391
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1549. SCHEROTZKI. Geregelte wasserwirtschaft grundlage jeder ertragsleistung. Landwirtbl. Weser-Ems 98:140-142. Feb.15,1951. 18 L2345
A regulated water economy is the basis for profitable yields. Drainage in Germany.

1550. SINGLETON, J. R. Coastal drainage problems in relation to waterfowl. Tex. J. Sci. 1(3):25-28. Sept.30,1949. 470 T31
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Tile drainage of citrus orchards in Australia.

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Quality versus cost. The effect of drainage on the quality of fruit in Netherlands orchards.

1553. SUTTON, J. G. Drainage as an aid to increased food production. Agr. Engin. 24:327-329,331,illus. Oct.1943. 58.8 Ag83

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Discusses drainage projects essential to the war effort, and suggests principles and methods of carrying out these projects under conditions at that time. Increased yields per acre of corn, soybeans, hay, and sugarcane are given for the United States as a whole.

1555. TILE drainage and its effect on plants. Horticulture 18: 453-454,illus. Nov.15,1940. 80 H787

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1558. ULRICH, R. Relative costs and benefits of land reclamation in the humid Southeast and the semiarid West. J. Farm Econ. 35:62-73. Feb.1953. 280.8 J822

Drainage in Mecklenburg County, in the Virginia Piedmont, and irrigation in the Columbia River Basin, Washington.

1559. U. S. NATIONAL RESOURCES PLANNING BOARD. Drainage in the river valley of the lower basin. In its The Pecos River joint investigation, p. 231-243,illus.,tables. Washington,1942. 173.2 N214Pec

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1561. VERMAAT, J. G. Observations on drainage conditions of Ceylon paddy soils with particular reference to those of the low-country wet zone. Trop. Agr. (Ceylon) 109:279-286. Oct./Dec.1953. Ref. 26 T751

For optimal production of rice, paddy requires subsoil and surface drainage to balance the water supply with water consumption.

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1565. WESTON, A. D. The drainage of low lands, and malaria. Boston Soc. Civ. Engin. 25:476-483,map,tables. Oct.1938. 290.8 B65
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Includes drainage. One hundred and three million acres of land "once water-logged through centuries with rainfall or spoiled by overirrigation or seepage are now in high production through the magic of drainage," p. 614.

1567. WOOTEN, H. H., and LEE, A. T. M. Costly development is needed for most potential farm land. Agr. Situation 33:6-7. Jan. 1949. 1 Ec7Ag
Requires drainage, clearing, and large-scale irrigation projects.

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The economy of adequate drainage extends through all phases of citrus grove operations from planting to picking. The deeper rooting made possible by good drainage is the chief factor of benefit.
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PROJECTS AND PROGRAMS

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Includes drainage projects in Yugoslavia, Turkey, Pakistan, and India.

1570. MAGOON, E. H. Drenaje y salud en la zona Caribe. Salubridad y Asistencia Social B. Ofic. 48:57-213,217-404,407,614,illus., maps. Feb.-Oct.1945. 449.75 C892S
Text in Spanish and English.
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1571. ACTIVITIES of the National Water Resources Committee. Civ. Engin. 7(3):167-177,illus. Mar.1937. 290.8 C49
A survey of drainage district projects and problems from regional and national viewpoints.

1572. ALLRED, C. E., ATKINS, S. W., and HENDRIX, W. E. Land drainage. Tenn. U. Rur. Res. Ser. Monog. 48:94-99,maps,tables. June 1937. Ref. 173.2 W89Co

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Irrigation, drainage, and flood control in New Mexico. The project includes 334 miles of drains and 1,000 miles of ditches.

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History of drainage for flood control and agricultural production in North Dakota.

1575. BARNARD, J. W. Working shoulder to shoulder in the Old Line State. Soil Conserv. 20:84-90,illus. Nov.1955. 1.6 So3S

Group drainage projects in Maryland.

1576. BENNETT, H., and RULE, G. K. Men against the Glades. Soil Conserv. 17:129-135,illus. Jan.1952. 1.6 So3S

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1577. BENNETT, H. H. Drainage of wet agricultural lands, for conservation and production. Washington,U. S. Soil Conserv. Serv., 1946. 7 p. 1.96 R31St

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1578. BENNETT, H. H. Water in the ground; too much or too little. Soil Conserv. 16:153-157,illus. Feb.1951. 1.6 So3S

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1579. BESTOR, H. A. The principal elements of a long time soil and water conservation plan for the Everglades. Soil Sci. Soc. Fla. Proc. 4A:90-99. 1942. 56.9 So32

"Indiscriminate drainage, the lack of centralized authority and interest of the State, the dormancy of the Everglades Drainage District ..., combined with the overdrainage of the area ... has developed real concern regarding the question of water management," p. 96.

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1581. BODDY, H. They all worked together. Soil Conserv. 20:40-43,illus. Sept.1954. 1.6 So3S

State, Federal, and local cooperation succeeds in draining 16,000 acres of wet farmland in Solano County, Calif., in the space of two years.

1582. BURNS, B. E. Artificial drainage in Blue Earth County, Minnesota. Lincoln,1954. 241 p.

Thesis (Ph.D.) — University of Nebraska, 1954.

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A history of drainage in Minnesota since 1898. Includes drainage districts, and the economic, social, and agricultural effects of drainage.

1583. CARAH, W. M. Pay dirt from Tule Lake. Tractor Farming 35(5):18,20,illus. Sept./Oct.1952. 58.8 T672

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1584. CARPENTER, R. W. Districts invoke drainage to increase crop-growing area. Soil Conserv. 8:275-277,illus. June 1943. 1.6 So3S

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1585. CHAPMAN, P. W. Taming the Tropics at home. Country Gent. 116(9):23,80,82-83,illus. Sept.1942. 6 C833

The Florida Everglades, and the Everglades Drainage District.

1586. CLARENBACH, F. A. Putting order into drainage programs

Land Policy Rev. 5(2):19-22. Feb.1942. 1 Ec7La
Government programs on the State, regional, and national level.

1587. CLAYTON, B. S., and JONES, L. A. Controlled drainage in the northern Everglades of Florida. Agr. Engin. 22:287-288,291. Aug. 1941. 58.8 Ag83
Description of the drainage system, maintenance of drainage ditches and pumping stations, subsidence of peat soils, mole drains, and levees.

1588. COLEMAN, W. H. Eight farmers drain land. Soil Conserv. 16:226-227. May 1951. 1.6 So3S
Cooperative project in Missouri to construct drainage ditches. Increased value of land in dollars per acre is given.

1589. DAVIS, J. F., and others. Wet lands of Virginia and community drainage enterprises. Washington, U. S. Bur. Agr. Econ. Appalachian Region, 1945. 26 p., maps. 1.941 L3W53
F. J. Marschner, R. McQuown, and A. J. McChesney, joint authors.
A study made with intent to compile pertinent historical data on drainage in Virginia, to consolidate available information on wet lands, to brief enabling legislation, and to formulate suggestions for future drainage organizations in Virginia. Includes the Dismal Swamp.

1590. DOVELL, J. E. The Everglades — a Florida frontier. U. Fla. Econ. L. 6(5),4 p.; (6),4 p. Apr.-May 1947. 280.9 F663
Summary of thesis (Ph.D.) — University of North Carolina, 1947.
Covers early history, first attempts at reclamation, the Disston drainage contract, origin of the Everglades Drainage District, and present agricultural condition of the reclaimed region.
Also in Agr. Hist. 22:187-197. July 1948. 30.98 Ag8

1591. DRAINAGE of Florida's Everglades. Engineer 165:444-446, illus., map. Apr.22,1938. Libr. Cong.
Drainage engineering by the U. S. Government around Lake Okeechobee.

1592. EAMES, H. F. Maryland's Eastern Shore revives. Soil Conserv. 20:114-119,illus. Dec.1954. 1.6 So3S
Group drainage work in seven Maryland counties has resulted in the construction of 2,900 miles of open and tile drainage ditches.

1593. EAMES, H. F. One needed practice led the way. Soil Conserv. 19:258-262,illus. June 1954. 1.6 So3S
Drainage program of the Caroline, Md., Soil Conservation District, which has helped drain over 800 farms.

1594. EDMINSTER, T. W., WALKER, J. P., and LILLARD, J. H. Drainage in conservation farming. J. Soil & Water Conserv. 5:77-79, 93,illus. Apr.1950. 56.8 J822
Engineers and conservationists must work together in determining the feasibility of drainage proposals, balancing the installation costs against the expected increase in revenues from the drained land. Discusses the land capability surveys being conducted in many States.

1595. EDWARDS, H. G. Drainage puts fertile Delta lands to work. Soil Conserv. 9(1):7-14,illus. July 1943. 1.6 So3S
History of drainage work in Mississippi. Includes organization of drainage districts and the work of various drainage projects.

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1603A. HARRISON, R. W., and KOLLMORGEN, W. M. Drainage reclamations in the Bartholomew-Boeuf-Tenas Basin of Arkansas and Louisiana. Ark. Agr. Expt. Sta. B. 476,68 p.,illus.,map,tables. Apr. 1948. 100 Ar42
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1612. KOENIG, N. A comprehensive agricultural program for Puerto Rico. Washington,U. S. Dept. Agr.,1953. 299 p.,illus.,map, tables. Ref. 1 Ag85Com

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1614. MCKINNON, A. D. Drainage in the Red River Valley. Soil Conserv. 12:104-107,118,illus. Dec.1946. 1.6 So3S

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1615. MAITS, B. Bring back your wet lands. Country Gent. 123(4):47,101-103,illus. Apr.1953. 6 C833

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1616. MANSON, P. W. Farm drainage in the future. Agr. Engin. 26:111-113,illus.,tables. Mar.1945. 58.8 Ag83

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1617. MARYLAND and Delaware construct big drainage project. Engin. News-Rec. 139:628-629,illus. Nov.6,1947. 290.8 En34

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